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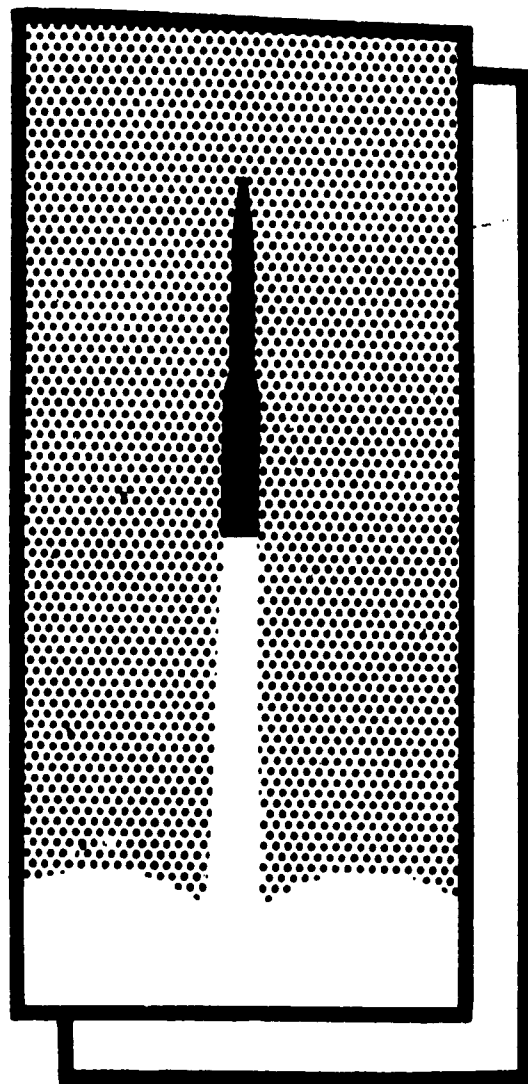
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MINUTEMAN



WS-133A

WING II

FINAL GROUND TEST

REPORT - FTM 625

NOV 30 1963

MINUTEMAN

WS-133-A

WING II

FINAL GROUND TEST REPORT

FTM 625

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Issue No. _____

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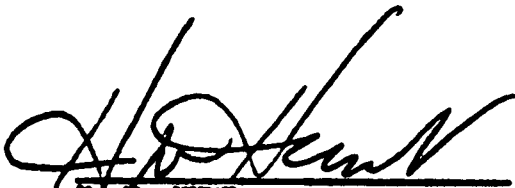
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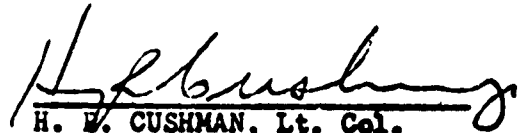
WING II FINAL GROUND TEST REPORT - FTM 625

This report has been prepared in accordance with Statement of Work, VAFB
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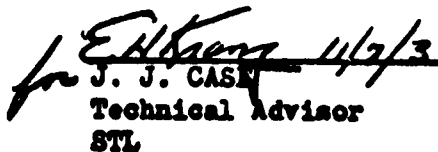
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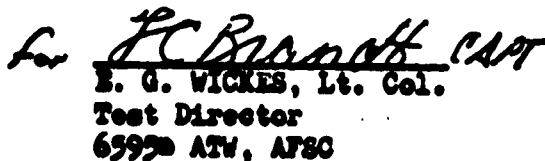


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1.0

PURPOSE

This report was prepared to provide a history of the receipt-through-launch processing of Flight Test Missile FTM 625, and to provide results, conclusions and recommendations developed from the test data. Test Operations and related activities are described in detail with special emphasis placed upon identification of Weapon System deficiencies.

2.0 ABBREVIATIONS

AF	Air Force
AGC	Aerojet General Corporation
A/N	Autonetics
BMT	Ballistic Missile Trailer
CCN	Contract Change Notice
CSD	Command Signals Decoder
CTLI	Combat Training Launch Instrumentation
DPIB	Destruct Package Installation Building
ECP	Engineering Change Proposal
EWG	Elevator Work Cage
FTM	Flight Test Missile
HLCF	Hard Launch Control Facility
LCF	Launch Control Facility
LCP	Launch Control Panel
LF	Launch Facility
MGS	Missile Guidance System
MIP	Material Improvement Package
MRE	Material Review Board
MSB	Missile Storage Building
QPRI	Qualitative Personnel Requirement Inventory
RSW	Range Safety Wafer
RV	Re-entry Vehicle
SLCF	Soft Launch Control Facility
SSCBM	Shipping and Storage Container Ballistic Missile
T-E	Transporter-Erector
T.O.	Technical Order
VCP	Volatile Code Packs
V&V	Validation and Verification
VRSA	Voice Repeating Signal Assembly
W/S	Weapon System

Summary

Wing II processing of FTM 625 consisted of the following tests;

Receipt of FTM 625 by rail, in an SSCBM, transfer to BMT, transport to DPIB, roll transfer missile, SSCBM to DPIB;

Preparation of the Missile for CTLI Modification, receipt, installation and checkout of the Missile downstage CTLI;

Roll transfer of the Missile, DPIB to T-E, transport to MSB, roll transfer Missile, T-E to MSB;

Receipt and checkout of MGS and CTLI units, Mating, and integrated checkout of the MGS/CTLI;

Receipt, Inspection, Assembly and Checkout of Mark 11, Model 5B re-entry vehicle (R/V) and Range Safety Wafer (RSW);

Roll Transfer of the Missile from the MSB, Transportation to the LF, Emplacement of the Missile and Installation of the MGS/CTLI and R/V and RSW;

Encoder-Decoder Replacement and Cable Configuration Hookup;

Missile and autocollimator fine alignment, Missile Start-up and targeting, and closed loop checkout;

Post-Emplacement Refurbishment, LF Enabling and Securing;

Final LF & LCF Launch Preparation and LF Enabling;

Launch Operations (R-1 and R-0 Day Checkouts).

Post-Launch and Pre-Emplacement Refurbishment.

4.0

STATUS

The charts in this section show test operations performed on FIM 770 and the associated Test Requirements from BSD TR 63-29 Volume II, that were achieved during these operations.

PROGRESS REPORT CHART

WING II

REF: BSD TR 63-29

TEST OPERATION		TEST REQUIREMENT	COMPLETION DATE
NUMBER	TITLE	NUMBER*	
625-1A	RECEIVE MISSILE BY RAIL (IN AN SSCBM), OFFLOAD, TRANSPORT TO MSB/DPIB, ROLL TRANSFER MISSILE, SSCBM TO MSB/DPIB.	2.3.1	21 May 1963
625-2A	ROLL TRANSFER MISSILE, DPIB TO T-E, TRANSPORT TO DPIB, ROLL TRANSFER MISSILE, T-E TO MSB.	2.3.1 2.3.2 2.3.3	28 May 1963
625-3	RECEIVE, INSTALL, AND CHECKOUT DOWNSTAGE CTLI.	2.3.11 2.3.27	10 June 1963
625-4	RECEIVE MGS AND CTLI, CHECKOUT, MATE, AND PERFORM INTEGRATED CHECKOUT OF MGS/CTLI.	2.3.8 2.3.9 2.3.10	29 July 1963
625-5	RECEIVE, INSPECT, ASSEMBLE, AND CHECKOUT RE-ENTRY VEHICLE, AND RANGE SAFETY WAFER.	2.3.31	19 June 1963
625-6	ROLL TRANSFER MISSILE, MSB/DPIB TO T-E, TRANSPORT TO LF, EMPLACE IN LF, INSTALL MGS/CTLI, RSW AND R/V.	2.1.2 2.1.6 2.1.7 2.1.9 2.3.4 2.3.7 2.3.12 2.3.25 2.3.30	23 August 1963
625-7	ENCODER-DECODER REPLACEMENT AND CABLE CONFIGURATION HOOKUP.	2.1.17 2.2.2	24 August 1963
625-8	ALIGNMENT, TARGETING, AND CLOSED LOOP CHECKOUT.		29 August 1963

PROGRESS REPORT CHART

WING II

*REF: ESD TR 63-29

TEST OPERATION		TEST REQUIREMENT	COMPLETION DATE
NUMBER	TITLE	NUMBER*	
625-9	POST-EMPLACEMENT REFURBISHMENT AND MISSILE SAFING PIN REMOVAL	2.3.25	29 August 1963
625-10	LAUNCH OPERATION (R-1 DAY)	2.3.17 2.3.19 2.3.20 3.1.2 3.1.4	28 August 1963
625-10A	FINAL LF & LCF LAUNCH PREPARATION AND LF ENABLING.	2.3.25 4.1.5	29 August 1963
25-11	LAUNCH OPERATIONS (R-O DAY)	2.3.17 3.1.4 2.3.19 3.2.1 2.3.20 3.2.2 2.3.21 3.2.3 2.3.22 4.1.5 3.1.2	29 August 1963
625-12	POST-LAUNCH AND PRE-EMPLACEMENT REFURBISHMENT.	2.3.24	24 September 1963

5.0

CONCLUSIONS AND RECOMMENDATIONS

5.1

Receipt-through-launch operations are similar for each missile processed. As a result, many of the deficiencies (particularly in the fields of equipment and safety) being reported have been reported during previous tests. Exposure of any major W/S deficiencies still undetected will probably require special testing designed to explore the extremes of the various subsystems design envelopes.

5.2

Unscheduled maintenance associated with Wing II testing has not received proper consideration. It is considered necessary to place greater emphasis upon coalition of unscheduled maintenance activities.

5.3

Greater Air Force participation in test performance is required to achieve a test program consistent with the Wing II Program Concepts and to accomplish the Program Objectives stated in BSD-TR-63-29.

6.0

TEST OPERATIONS PERFORMED

This section provides a detailed description of Wing II Receipt-through-launch Processing of FTM 625.

6.1 TEST OPERATION 625-1A RECEIVE MISSILE BY RAIL (IN AN SSCBM) OFFLOAD,
TRANSPORT TO MSB/DPIB, ROLL TRANSFER MISSILE,
SSCBM TO MSB/DPIB.

6.1.1 Summary

This operation consists of receiving a Flight Test Missile in an SSCBM by rail, offloading the Ballistic Missile Trailer (with loaded SSCBM) from the rail car, transporting the BMT to the DPIB #2, and roll transferring the missile from the SSCBM to the DPIB #2. The test requirement accomplished during this operation is Missile Transportation and Unloading (Receiving to DPIB) 2.3.1 as outlined in BSD-TR-63-29.

6.1.2 Test Description

Test Operation 625-1A was performed by grade and quality of Air Force Personnel described by the test matrix under Personnel Requirements. Test Operation 625-1A started at 1100 hours on May 21, 1963, and was completed at approximately 1330 hours with the receipt at the DPIB #2.

Requirements for unscheduled maintenance did not exist. However, the Air Force Team Chief and Air Force Personnel unlocked the panels on the air conditioning unit which creates missile environment for the SSCBM. While the unit was unattended, during the lunch hour, the panel on the left rear fell off. The upper right hand corner of the panel was damaged and required on the spot maintenance in order to refit the panel to the air conditioning unit. Maintenance personnel were not called. The Air Force Team Chief and Air Force Personnel accomplished the repair.

6.1.3 Equipment and Facility Evaluation

E-38 In an attempt to position the flatcar on the rail siding for unloading of the SSCBM, the car was located too close to the offloading ramp. This caused the loading bridge of the rail car to mate improperly with the offloading ramp. This alignment caused some unnecessary accelerations of the missile.

Conclusion: Misalignment of the offloading bridge.

Recommendation: Selection and permanent installation of wheel chocks on the rails at the offloading ramp. This will eliminate future problems of this type.

6.1.4 Human Engineering Evaluation

HE-14 According to T.O. 21-SM80A-2-2, both BMT suspension system valve levers must be positioned to "RIDE". Inspection of the valve levers showed that there was no indication on the BMT as to which direction the controls must be turned to "OPEN" or "CLOSE" the levers. In addition, one control indicates that it "opens to ride", the other control "closes to ride".

Conclusion: Technicians were confused as to which direction to turn the controls and by the opposing directions for the same operation. The function was accomplished only after considerable discussion and trial and error efforts.

Recommendation: (1) Label arrows indicating "open" and "close" positions.
(2) Change controls so that both levers are put in "open" position to ride, and "close" position to dump.

6.1.5 Technical Order Evaluation

No technical order deficiencies were noted.

6.1.6 Personnel Requirements Evaluation

No deficiencies were noted.

6.1.7 Training Evaluation

Problem areas noted which could be resolved through training:

- (1) Individual technicians continue to lift heavy equipment; personnel performing such tasks may easily injure themselves or others, especially when tired.
- (2) A technician was observed dropping a cannon plug from the railcar to the ground (2-3 ft. distance) instead of handing it to another technician on the ground. Repeated dropping of the plug could damage it.
- (3) A technician backed the SSCBM into the DPIB rails and punctured two holes in the SSCBM skin. The tractor driver misinterpreted the hand signals given to him. A standard set of hand signals should be established, and appropriate training given individuals in their proper use.

6.1.8

Safety Evaluation

Safety items associated with the Training Evaluation (para. 6.1.7) were noted during the test.

6.2 TEST OPERATION 625-3 INSTALL AND CHECKOUT MISSILE DOWNSTAGE CTLI

6.2.1 Summary

This report covers the CTLI Downstage Installation on FTM 625. Processing was performed at OO-Z-L2 using AFTO work orders, annexes B, C, and D or Wing II Test Operations Plan 625-3 and applicable technical orders. Test Operation 625-3 started at 1500 hours on 21 May, 1963, and was completed on 2 August, 1963.

The normal time needed to complete this test is approximately three (3) days, working two (2) eight (8) hour shifts (48 hours). All holds were due to equipment failure and parts misfits.

Air Force personnel performed all work pertaining to this test operation until 2400 hours on 24 May, 1963. The Air Force was unable to support the operation after the above date and the test was completed by Boeing personnel. The operation was completed, less 6-hour CTLI battery installation, and was considered a satisfactory Wing II Test.

6.2.2 Test Description

Test Operation 625-3 entailed the installation and checkout of Missile Downstage CTLI in OO-Z-L2. The operation was performed by members of the 394th Missile Squadron from 1530 hours on 21 May 1963, through 24 May, 1963, on a two-shift basis. From 0800 hours on 27 May, 1963, through test completion date, 2 August, 1963, Boeing personnel performed all work pertaining to the test. Technical Order 21-SM80A-2-17-1 (23 April, 1963) served as technical data for the test. The operation proceeded without incident from 1530 hours on 21 May, 1963, to 1430 hours on 22 May, 1963, when numerous holds and interruptions hampered the test operation. Discrepant parts, with replacement parts not immediately available or requiring rework, resulted in test steps occurring out of sequence and a subsequent loss of time.

Air Force personnel were used to prepare missile for roll transfer from OO-Z-L2 to OO-Z-M4. However, due to delays and test holds and

the scheduling of Category III missile 634 to OO-Z-I1, missile 625 was roll transferred to OO-Z-M4 by Boeing personnel. Boeing personnel were used in completing Test Operation 625-3 in OO-Z-M4 from 2100 hours on 27 May, 1963, through 2 August, 1963, including test hold time. ECP 606 and ECP 620, static ground revisions, and CCP 1232, checkout of third stage operational pressure transducer (CPT) were incorporated by Boeing personnel using contractor work orders. An interchangeability check of the CTLI covers was performed using contractor work order job IR 021. A portion of ECP 620 remains open, to be performed in the LF after emplacement of G&C and R/V.

6.2.3

Equipment and Facilities Evaluation

The first CTLI electrical cable assembly installed on the missile separated at the I-II interstage disconnect plug. The second cable installed failed the continuity check. The third cable delivered to the OO-Z-LO arrived with both of its interstage disconnect plugs separated. The fourth cable, ordered from off base and delivered by air, proved to be satisfactory on checkout after installation.

During removal of the second CTLI cable from the missile, a nut was dropped into the II-III interstage. Material Review Board (MRB) disposition was to "use as is".

The I-II interstage seat plate did not match the interstage. This problem was first reported during Wing I and still remains. It is considered negligible in that the mismatch can be resolved with minor rework to the parts. This problem is not associated with the operational components.

During the second stage engine CTLI installation, the Avcoat was found to be damaged with scratches in the titanium engine casing. Aerojet-General Corporation (AGC) representatives were called and after deliberation decided to repair the Avcoat. The repair was accomplished with the missile in OO-Z-M4.

6.2.4 Human Engineering Evaluation

No new human engineering problems were noted.

6.2.5 Technical Order Evaluation

No significant T.O. deficiencies were observed during this operation.

6.2.6 Personnel Requirements Evaluation

The Air Force teams were generally capable of performing the required functions and received only minor contractor assistance on the Wing II peculiar items of equipment. It is believed that Air Force personnel will be able to perform the required functions without contractor assistance.

All of the AF team members held duty AFSC's of 443XOG. The first shift team consisted of five technicians except for the last day when one T/Sgt was added to the team for OJT. The team chief from second shift replaced an airman team member on first shift on 27 May. The second shift team consisted of the same four technicians throughout the test.

6.2.7 Training Evaluation

The training status of the 394th Missile Squadron team members performing the function test is presented in Table 1.

TABLE 1: Test 625-3 Team Training Status

PERSONNEL				TRAINING			
Rank	Code	Duty AFSC	Shift	Type I	Type II	ORT	OJT
S/Sgt	1	4437OG	1	Yes***	No	N/A	Yes
A/1C	2	4435OG	1	Yes	No	N/A	I
A/1C	10	4435OG	1	No	Yes	N/A	I
A/1C	3	4435OG	1	Yes	Yes	N/A	Yes
A/3C	4	4435OG	1	Yes	Yes	N/A	Yes
S/Sgt*	6	4435OG	2	Yes	Yes	N/A	I
A/2C	7	4435OG	2	Yes***	No	N/A	Yes
A/2C	8	4435OG	2	Yes	Yes	N/A	Yes
A/2C	9	4435OG	2	Yes	No	N/A	Yes
T/Sgt	5	4437OG	1**	Yes	No	N/A	I

Legend:

Yes = Training completed
 No = Training not received
 I = Training incomplete

Code = Airman identification
 (PSTE file: AF Team Training Inf.)

ORT = Operational Readiness Training
 OJT = On-the-Job training
 N/A = Not applicable
 AFSC = Air Force Specialty Code

6.2 .7 Training Evaluation (Continued)

Legend: (Continued)

Type I = Training by contractor usually at factory
 Type II = Training at AF technical school

* = Team Chief
 ** = 27 May 1963 only
 *** = Ordnance only - no weapon system

The AF teams were generally capable of performing the required functions and received only occasional contractor assistance on the Wing II peculiar items of equipment.

6.2 .8 Safety Evaluation

No significant safety deficiencies were observed during this operation.

6.2 .9 Time Analysis

Total test time for the incomplete test was 68 hours. Total performance time was 35 hours. A time comparison with earlier tests is shown in Table 2.

TABLE 2: Test and Performance Time for Various CTLI Test Operations

Test Operation	Team Composition	Total Test Time (in hours)	Performance Time
502-3	2, 4-men each	64	*
511-3	1, 2-men each	200	*
	1, 3-men each		
514-3	2, 4-men each	60	38
521-3 (45% compl)	2, 3-men each	80	23 (51)
529-3	2, 4-men each	227	55
534-3	2, 4-men each	176	*
565-3	(Entire test not observed)		
585-3	2, 4-men each	64	44
604-3	2, 5-men each	48	*
625-3 (75% compl)	1, 4-men each	68	35 (47)
	1, 5-men each	-	

*Unknown

If the performance time of 23 hours for Test 521-3 (44% complete) is projected to completion, the performance time becomes 51 hours. The projected performance time for completion of the present test is 47 hours (Table 2). The mean time for the five scores is also 47 hours, so the present test may be said to have required the average performance time compared to those tests where the performance time is given.

6.3 TEST OPERATION 625-2A ROLL TRANSFER MISSILE, DPIB TO T-E,
TRANSPORT TO MSB, ROLL TRANSFER
MISSILE, T-E TO MSB

6.3.1 Summary

This test consists of roll transfer of a missile from a DPIB to a T-E, moving the T-E to an MSB, and roll transferring the missile from the T-E to the MSB.

6.3.2 Test Description

The test was started at 1620 hours on 27 May, 1963, with the pre-test inspection of the T-E as required by the Test Matrix. The T-E was moved to DPIB #2 and roll transfer of the missile was started at 1650 hours. Transfer was completed at 1945.

The loaded T-E was moved to Transient Storage Pad #1 and held there until 0800 hours on 28 May, 1963.

The operation was resumed when the loaded T-E was moved to MSB #4 and roll transfer of the missile was started at 0830 hours.

The operation was completed at 1100 hours.

The entire operation was conducted by Boeing personnel, without Air Force participation. No problems were encountered.

A transport Monitor set was not available for the operation. A waiver was obtained deleting the requirement from the Test Matrix.

6.3.3 Equipment and Facilities Evaluation

All equipment and facilities were satisfactory for the purposes of the test.

6.3.4 Human Engineering Evaluation

No human engineering evaluation was performed.

6.3.5 Technical Order Evaluation

All procedures followed were satisfactory.

6.3.6 Personnel Requirements Evaluation

No evaluation was accomplished since Air Force personnel were not utilized as items in test.

6.3.7 Training Evaluation

No training evaluation could be accomplished.

6.3.8 Safety Evaluation

All safety procedures were adequate.

6.3.9 Time Analysis

No evaluation was accomplished since Air Force personnel were not utilized as items in test.

6.4.1

Summary

This operation consists of receiving a Wing II MGS (Missile Guidance System) and a CTLI (Combat Training Launch Instrumentation) wafer, checking each unit separately, mating the units mechanically and electrically, checking the combined units and preparing the package for shipment.

During Test Operation 625-4 deficiencies were noted in the "A", "B", and "C" tapes. These are discussed in Paragraph 6.4.3. In some instances the technical order descriptions did not match the configuration of the area and/or equipment. These deficiencies are discussed in Paragraph 6.4.5. No significant deficiencies were noted in other areas.

This operation is not required for an operational missile, and will not be performed at an operational base.

Delays encountered during this operation were due to installation problems with an ordnance switching unit (OSU) and late delivery of the CTLI wafer.

Test Requirements 2.3.8, 2.3.9 and 2.3.10 of BSD-TR-63-29, Volume II, "Wing II Test Program Plan" were accomplished during this operation.

6.4.2

Test Description

Test Operation 625-4 was conducted at the CSA (Contractor Support Area). The operation was performed by Boeing personnel.

The operation was started at 0830 hours on 23 July, 1963, with the checkout of MGS AAL 0392. This MGS was rejected for a "No-Go" during "A" tape checkout. Information received after the test proved the MGS should not have been rejected.

MGS AAL 0393 was checked out satisfactorily, finishing "B" tape at 1520 hours on 24 July, 1963. Following this checkout the test was delayed until 1300 hours on 26 July, 1963, when the CTLI wafer was received at the CSA. The Mode "B" tests were accomplished on the CTLI wafer satisfactorily and the MGS was skinned and prepared for mating. ECP 447 was accomplished and the SE35B cable was installed while the MGS was skinned. After the skin was replaced and rounding was completed, the mating surfaces of the MGS and CTLI were cleaned in preparation for the bonding check (ECP 551).

After mating, the combined MGS/CTLI sections were checked using the "C" tape and then prepared for shipment. The test was completed at 1900 hours on 29 July, 1963.

6.4 .3

Equipment and Facilities Evaluation

Difficulties were encountered in the operation of the C91 Test Center, Programmer - Fault Locator (Figure "A" 624). These deficiencies, listed below, resulted from the fact that the programming tapes and the technical order data do not reflect the present Wing II MGS and MGS/CTLI equipment configuration.

E-39 The "A", "B", and "C" tapes all produced "No-Go's" during the test operation. "No-Go's" were experienced during the following tests:

Tape	Step		
A	M/T 5112	S/T 530	
	M/T 5140	S/T 010	621
		S/T 011	622
		S/T 012	623
B	M/T 5254	S/T 513	
	M/T 5256	S/T 513	
C	M/T 8200	S/T 2	

Conclusion These "No-Go's" cause delays while the documentation is checked for limits, and may cause rejection of units where the documentation available does not reflect current limits.

6.4.3 (Continued)

Recommendation The program tape deficiencies should be corrected and T.O.'s 21-SM80A-2-17-1 and 5A1-2-32-2 should be updated at the earliest possible time. Design Engineering is determining the required action on the tape deficiencies. Technical order deficiencies have been corrected by the following TOFCN's, VB 26, VB 27, VB 29, and VB 30 to T.O. 5A1-2-32-2 and VB 469 to T.O. 21-SM80A-2-17-1.

6.4.4 Human Engineering Evaluation

No significant human engineering deficiencies were noted.

6.4.5 Technical Order Evaluation

The following deficiencies between the equipment and facilities and the T.O. were noted. These deficiencies are generally of long standing and are compensated for by experienced personnel. In order to render the operation as complete as possible for less experienced personnel, the following deficiencies are noted and discussed.

T.O.-60 The Gross Temperature indicator lights are off when outside the specified operating range and on when within the specified operating range. T.O. 21-SM80A-2-17-1, paragraph 4-26D, a., indicates the reverse condition should apply.

Conclusion The instructions in the T.O. are erroneous with the system in its present configuration and would result in a shut-down of the test when the temperature was within the proper limits.

Recommendation Change T.O. 21-SM80A-2-17-1, paragraph 4-26D, a., where it reads "goes on" to read "goes off".

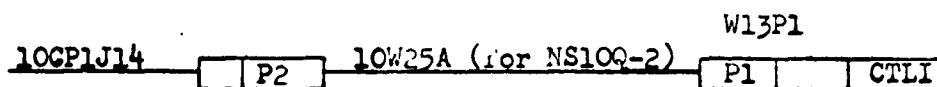
AFTO 22 A/N PSTB 2-94 has been submitted.

6.4.5 (Continued)

T.O.-74 The Integrated Checkout hook-up in T.O. SM80A-2-17-1, Figure 4-24, does not include cable 10W25A. This cable is applicable to the NS10Q-2 MGS.

Conclusion The lack of reference to the 10W25A cable may cause considerable delay and confusion during testing.

Recommendation Amend Figure 4-24, T.O. 21-SM80A-2-17-1 to include the 10W25A cable, see drawing below:



AFTO 22 A/N PSTE 2-96 has been submitted.

T.O.-68 Paragraph 2-38g and h of T.O. 5A1-2-32-2 direct the removal of the shorting cap from 4P3 underneath the MGS and storing the shorting cap with the SE62 loose equipment. This shorting cap is used with the NS10P MGS. The T.O. reference as written, is applicable to all MGS, the NS10P, Q and Q2.

Conclusion Confusion can result both during the testing and following the testing when the shorting cap cannot be found.

Recommendation Add "Applicable to NS10P only" after each of the two sub-paragraphs g and h, 2-38, T.O. 5A1-2-32-2.

AFTO 22 A/N PSTE 2-95 has been written about this deficiency.

6.4.6 Personnel Requirements Evaluation

Due to the use of contractor personnel this area was not evaluated.

6.4.7 Training Evaluation

Due to the use of contractor personnel this area was not evaluated.

6.4.8 Safety Evaluation

No significant safety problems were noted during this operation.

6.4.9 Time Analysis

Due to the use of contractor personnel and delays in delivery of components, this area was not evaluated.

6.5

TEST OPERATION 625-5

RECEIVE, INSPECT, ASSEMBLE AND CHECKOUT
RE-ENTRY VEHICLE (R/V) AND RANGE SAFETY
WAFER (RSW) AT VAFB.

6.5.1

Summary

Wing II Test Operation 625-5 entailed the receiving, unpacking, inspection, component checkout, assembly and final checkout of a Mark 11, Model 5B (S/N-2), Re-entry Vehicle with Range Safety Wafer at the 51st Munitions Maintenance Squadron Facility (Building 1544) at Vandenberg Air Force Base, California. Upon completion of the aforementioned tasks, the R/V and RSW were placed in multi-cubicle storage pending R/V-G&C Semitrailer loading for subsequent transport to the launch facility and mating to the Flight Test Missile.

The accomplishment of the Test Operation satisfied the following test requirement contained in document BSD-TR-63-29, Wing II Test Program Plan, Volume II, Test Requirements:

<u>Test Requirement Title</u>	<u>Test Requirement Number</u>
Receive, Inspect, Assemble and Checkout R/V and RSW at VAFB.	2.3.31

The Test Operation was performed by QQPRI personnel in the sequence indicated by the test matrix, using authorized technical orders and equipment.

6.5.2

Test Description

Wing II Test Operation 625-5 commenced with a 15 minute Pre-Test Meeting in the Munitions Facility at 0845 hours on Tuesday 4 June, 1963, and continued through Friday, 7 June, 1963. On Wednesday, 19 June, 1963, the test exercise was resumed and concluded with a Post Test Meeting at Building 5203 on 19 June, 1963.

On Friday, 7 June 1963, the Re-entry Vehicle assembly was halted due to a problem which developed in the adjustment of the R/V Separation Connector mechanical lanyard. Employing the current T.O. 11N-RV11-2A

procedures, this task could not be accomplished. After investigation by Avco Engineering, a test waiver was prepared and approved by the Wing II Deputy for Plans and Evaluation authorizing a workaround procedure for this test step. Employing the workaround, the Re-Entry Vehicle assembly exercise was resumed and concluded on Wednesday, 19 June 1963. The test waiver was not of a nature to prevent the accomplishment of the test requirements and objectives.

That portion of the Test Operation relative to the receiving, unpacking, preliminary electrical checkout, assembly and final electrical checkout of the Re-entry Vehicle and Range Safety Wafer was accomplished by QQPRI personnel of the 51st Munitions Maintenance Squadron. The checkout of the Range Safety Wafer "C" Band Beacon was accomplished by QQPRI personnel of the 1st STRATAD 4392nd Communications Squadron Instrumentation Group. During the entire exercise, Avco technical personnel were on hand to support all activities performed by the QQPRI personnel.

Preliminary Technical Order 11N-RV11-2A, employed in the test exercise for the Re-entry Vehicle and Range Safety Wafer assembly and checkout peculiar to the Vandenberg Operation, was validated during the Test Operation. Technical Order 11N-RV11-2, the operational T.O. for Re-entry Vehicle assembly and checkout used to supplement T.O. 11N-RV11-2A, was previously validated and verified.

6.5.3 Equipment and Facilities Evaluation

The Munitions Facility equipment and bay area was found to be adequate.

6.5.4 Human Engineering Evaluation

No human engineering deficiencies were noted.

6.5.5 Technical Order Evaluation

Technical Order areas of investigation identified during the test are detailed as follows:

- T.O.-21** Preliminary T.O. 11N-RV11-2A, paragraph 2-17, should provide a procedure for electrically testing the Separation Event Switch during R/V assembly. Trouble Report No. 8573 was prepared and submitted to report this comment. The report included a disposition for testing the switch during the Test Operation. Avco technical Publications is investigating.
- T.O.-22** Preliminary T.O. 11N-RV11-2A, paragraph 2-17, should provide a procedure for assembling the Separation Event Switch, as the switch was received without associated hardware assembled. Trouble Report No. 8570 was prepared and submitted to report this discrepancy. The report recommended that the T.O. should include the switch assembly procedure. For Test Operation 625-5, the switch was assembled per blueprint drawing specifications. Avco Technical Publications is investigating.
- T.O.-23** Following preliminary T.O. 11N-RV11-2A procedures, the R/V Separation Connector mechanical lanyard cannot be adjusted. Trouble Report No. 8562 was prepared and submitted to report this discrepancy. For Test Operation 625-5, a workaround procedure for the lanyard adjustment was employed, however, for future tests, Avco Technical Publications is taking action to revise the T.O.

6.5.6 Personnel Requirement Evaluation

The personnel requirement for the Test Operation was found to be adequate.

6.5.7 Training Evaluation

The training received by the R/V Maintenance Team of the 51st Munitions Maintenance Squadron employed in the Test Operation is detailed as follows:

RANK	DAFSC	TRAINING			
		TYPE I	TYPE II/III	*RVVTP	CJT
T/Sgt	33170B	Yes	No	Yes	I
A/3C	33150B	Yes	No	Yes	I
A/3C	33150B	Yes	No	Yes	I

*RVVTP: Re-entry Vehicle Team Training Program

QQPRI personnel from the 1st STRATAD, 4392nd Communications Squadron Instrumentation Group performed the Range Safety Wafer "C" Band Beacon checkout. The procedure employed in this function is similar to the Wing I Program with this personnel group currently performing on the job type training.

6.5.8 Safety Evaluation

During the Test Operation, all established safety precautions were observed, with no new safety deficiencies identified.

6.5.9 Time Analysis

Exclusive of the Pre- and Post Test Meetings, a total of 18 hours were spent to accomplish the test exercise.

6.6

TEST OPERATION 625-6

ROLL TRANSFER MISSILE, MSB/DPIB, TO T-E, TRANS-
PORT TO LF, EMPLACE IN LF, INSTALL MGS/CTLI,
RSW AND R/V.

6.6.1

Summary

Flight Test Missile 625 was removed from OO-Z-M4 by an Air Force T&H Team on 20 August, 1963, and emplaced in OO-07 by an Air Force T&H Team on 21 August, 1963. The MGS/CTLI was emplaced on 22 August, 1963 by both an Air Force Missile Team and Contractor personnel. Contractor personnel installed the raceway covers, conducted continuity and hazardous current checks, and connected cabling to the CTLI. The Air Force Missile Team finished the work associated with MGS/CTLI installation and checks, installed and corrected mechanical mating and checks of the R/V, and checked the level of the missile.

Several equipment and facility and human engineering deficiencies were encountered.

The Air Force teams, although not properly structured per QPRI standards, demonstrated that they were capable of performing the required tasks in this test.

The technical orders are considered adequate and correct enough for this test. Some changes were made to the technical orders during T.O. V&V of portions of the test.

6.6.2

Test Description

The test began at 1830 hours on 20 August, 1963 with the roll transfer of the missile from an MSB to a T-E. There was a 45 minute delay at start of test because of unavailability of a T-E. There was a failure of the pump on the 5th wheel translating jack. The roll transfer operation was finished at 2140 hours the same day with transporting of the T-E to a transient storage area.

The site operations were scheduled to start on the second shift of 21 August, 1963, and the T-E arrived at the site at 1230 hours on this date. A delay of one hour before starting emplacement was due to some work on the launch facility sump pump. Emplacement was completed and the T-E driven away at 2200 hours. Operations ceased for the day.

6.6.2

Test Description (Continued)

Testing resumed on 22 August, 1963 at 0745 hours. The work platform was installed at 0935 hours. The R/V-MGS Van was emplaced by 1007 hours at which time the MGS/CTLI emplacement started. The MGS/CTLI was electrically and mechanically mated by 1225 hours. Installation of the MGS raceway covers, accomplishment of continuity and hazardous current checks and hook-up of cabling to the CTLI were completed by 1355 hours. A loss of three hours work resumed. ECP 620, which was begun in the DPIB, was complete at 1806 hours. CTLI umbilical was hooked up and the raceway covers were sealed to finish out the second shift.

Test resumed on 23 August, 1963, the MGS umbilical was hooked up, squib and jumper installed, continuity and hazardous current checks conducted, the RSW and the R/V installed and the missile level check conducted to finish the day and the 625-6 test at 1735 hours.

6.6.3

Equipment and Facilities Evaluation

Several equipment and facility deficiencies which were previously noted were again observed during this test. They were:

- (a) At present there is not a work platform in the MSB to facilitate working in the aft end of the T-E. Removal of the restraint beams and rods is difficult while standing in this restricted space in the T-E. Removal of the restraint beams by one man also poses a threat to the nozzles because of work space forcing one man to handle the beams.

Contractor engineering recommended furnishing a work platform, FSN 1730-294-8883, as a Non-Figure A item. One platform, only, was recommended for use in all MSBs. It was planned to utilize this platform in the next release of Functional Analysis Form B 25-27001, "Receive Missile Downstage and Install in DPIF", System Specification 8-133-11-0-1 (D2-12130, Volume 1-A). The engineering on this was closed as of 8 August, 1963.

The above recommendation was not implemented and engineering study on the problem was re-released on 8 October, 1963. This is also a Safety item.

- (b) Work-around equipment (a wood platform) was used to install the RSW and R/V. The Boeing Company Engineering is doing some preliminary work against ECP 693 - for which a CCN is overdue. ECP 693 calls for use of a Western Gear Support Assembly instead of the Hamilton Standard one - to attain an extra 10 inches in height. A slight re-design of the cage yoke will give an additional 4 inches or 14 inches gain in height for the working floor of the EWC. This change is for the operational base EWC.

ECP 715, for which a CCN is expected on 23 December, 1963, will furnish a new Figure A 9437 - an accessory yoke for use at VAFB. This special yoke used on the EWC of the ECP 693 configuration will raise the working floor of the work cage an additional 12 to 15 inches. The exact figure not settled on as of 8 October, 1963. The use of this special yoke on an ECP 693 configured EWC would then result in an overall gain in height of 14 plus 12/15 inches - 26 or 29 inches. The actual requirement is starting with the ECP 693 change, that the ECP 715 change raise the work cage floor level to within 65 1/2 inches of the center line of the silo EWC track. Incorporation of these two changes will solve the EWC height problems.

- (c) Quick-release pins on the T-Es are prone to stick and require considerable time, force, and patience to remove or install. These pins are carried as E-72 in the Wing I, Category II Progress Report #4, "Deficiency Status Report". There was a UR submitted, which resulted in a MIP 0063-1570 being assigned to the problem. The Boeing Company Engineering has no record that this MIP has been projected out to industry. Boeing engineering states, also, that a suggestion was made several months ago to relieve the tolerances at the pin usage

points to alleviate the problem. This suggestion was not acted on. Information from Boeing engineering is that several recommendations - one or two ECPs also - are probably being held by the Air Force pending release of an overall ECP to accomplish all the T-E improvements at one time.

For the present there seems no relief from the quick-release pins problem except that of care in removal and insertion of the pins. Use of force will probably result in removal of the special plating on the pins, further aggravating the condition.

Two equipment deficiencies were noted:

- E-36** Failure of the translating jack (5th wheel) during missile roll transfer. Hydraulic fluid exhausted. This reported in Wing I.

Conclusion: The jack has marginal fluid capacity for the task and has a seal in the hand pump that is prone to failure.

Recommendation: An additional fluid reservoir be added. The Boeing Company Engineering has been notified of the problem, along with a suggestion to install different seals. Additional investigation will be conducted.

- E-37** The NCU and CTLI cable runs - bare and down the inner wall of the sile - represent considerable loss of cabling, hardware and time to replace them, after a launch.

Conclusion: That the cable run should be relocated or that a metal cover be used to prevent damage during a launch.

Recommendation: The Boeing Company Engineering has been given a recommendation to install the cable in conduit or raceways to a junction box below the missile support ring and to heat and gas seal per standard practice. Short umbilicals, approximately 12 feet long, could be used to the base of the missile. Approximately 150 feet of umbilical cable could be saved during each firing, plus the hardware and the time it takes to install them.

6.6.4

Human Engineering Evaluation

No human engineering deficiencies noted during the test. No new human engineering problems were noted during this test.

6.6.5

Technical Order Evaluation

The following changes were made to the technical orders as a result of technical order validation and verification performed during this test.

- (1) The 33416-1 (J151A-P151A) cable assembly is no longer installed in the C-Band Beacon Spacer (RSW) at the launch facility. Changes were made to paragraph 5-33D and 5-33E of T.O. 21-SM80A-2-17-1 to reflect this.
- (2) A new bonding check between the C-Band Beacon Spacer and the CTLI wafer is required. This change also affected the sequence of events at this time in the test. Changes were made to T.O. 21-SM80A-2-17-1, paragraphs 5-33A and 5-33F to change the installation of the aerodynamic filler plugs to after the bonding check; the bonding check was put in by adding paragraph 5-33F.1.
- (3) The mechanical mating of the R/V to the missile was not called out in the technical order procedures paragraph that positioned the R/V on the missile. The technical orders did not contain the resistance

check between the R/V and the C-Band Beacon Spacer. These changes were made to T.O. 21-SM80A-2-17-1 paragraphs 5-33H, 5-33I and 5-33J, and adds 5-33H.1. Paragraph 9-21 in T.O. 21-SM80A-2-8 affecting handling and mating equipment used in the -2-17-1 procedures, was also changed.

T.O.- 73 The electrical checks and shunt wafer installation for the NCU umbilical are not contained in the technical orders.

Conclusion: These checks must be accomplished for each NCU umbilical connection after ECP 590 has been accomplished.

Recommendation: That these procedures be included in the technical order.

Incorporation of ECP 590 procedures has been accomplished as of this date and no other action will be needed.

T.O.- 72 Torquing values for installing the Rail Retainers. This information, specifying a torque value of 500-600 in. lbs., was previously contained in a note on Index 4 of Figure 6-33 of T.O. 21-SM80A-2-2 and was removed by AFTO 22 WII/TF-63-6 on the basis that a special wrench adapter was required to measure the value and the value is not critical. Because of the cost involved, the torque value stamped on the retainers was not removed.

Conclusion: Confusion will still exist during installation of the Retainers in that the technician and/or inspector will feel that he must comply with the torquing values which are metal stamped on the Retainers.

Recommendation: A note should be inserted in the technical order prior to step j5, paragraph 6-12, to add the following note.

NOTE

Torquing values metal stamped in the Rail Retainers for their installation need not be measured. Estimated values are adequate.

An AFTO 22 No. WII/TF 63-25 is being submitted to provide this note.

6.6 .6

Personnel Requirement Evaluation

Neither of the two T&H teams nor the one missile team was made up per QPRI standards. The teams, as structured, demonstrated that they were capable of performing the required tasks. The teams were as follows:

Team #1 consisted of three (3) vehicle operators (AFSC 630XOB) and one (1) missile mechanic (AFSC 443XOG). Team Chief was a 603XOB, deviating from QPRI (D2-5859, Vol. II) which designates a 443XOB.

Team #2 consisted of two (2) vehicle operators (AFSC 603XOB) and two (2) missile mechanics (AFSC 443XOB), deviating from QPRI which designates one (1) 443XOB and three (3) 603XOB's.

Team #3 consisted of two (2) missile system analyst technicians (AFSC 312X4G), two (2) nuclear weapons specialists (AFSC 541XOG) and one (1) missile mechanic (AFSC 443XOG), deviating from QPRI which designates only one (1) 312X4G.

6.6 .7

Training Evaluation

All teams performed their tasks well and were familiar with all the operations. T.O.s or a checklist were used at all times. The training received by the teams is as follows:

TRAINING						
RANK	DAFSC	TYPE I	TYPE II	ORT	OJT	TEAM
*S/Sgt	60350B	No	No	No	Yes	T&H #1
A/1C	60350B	No	No	No	Yes	T&H #1
A/1C	60350B	No	No	No	Yes	T&H #1
A/2C	44350G	Yes	No	No	Yes	T&H #1
*T/Sgt	44370G	Yes	No	Yes	No	T&H #2
**S/Sgt	60370	No	No	Yes	No	T&H #2
A/2C	60350B	No	No	No	Yes	T&H #2
A/2C	44350B	Yes	No	Yes	Yes	T&H #2
**M/Sgt	312746	Yes	No	Yes	Yes	Miss. #3
**S/Sgt	33170B	Yes	Yes	Yes	Yes	Miss. #3
A/1C	54150G					
A/1C	31254G					
**A/1C	44350G	No	Yes	Yes	Yes	Miss. #3
**A/2C	33150B	No	Yes	Yes	Yes	Miss. #3

LEGEND:

DAFSC - Duty AFSC
 * - Team Chief
 ** - ORT Training Instructor
 Type I - Individual training given by contractor
 Type II - Air Force technical school individual training
 ORT - Operational Readiness Training
 OJT - On-the-job training

6. 6.8

Safety Evaluation

8-14 The launch tube access door winch is a hazard to personnel working near the access door.

Conclusion: The winch is actually a safety deficiency at eye level and sticks out into an already congested work space. It takes considerable presence of mind and some bending and stooping to prevent banging head or shoulder against it.

Recommendation: Since traffic in this area is considerably less on an operational site and redesign or relocation of the winch would be quite expensive for the gain to be realized - leave as is and fashion, locally, a better padding than that now used.

There is a different design winch, which is in place in 00-08.

6.6.8 Safety Evaluation (Continued)

The lack of a work platform for use at the rear of the T-E during work at the MSB is presently carried as S-9 in the current Wing II Monthly Progress Report "Deficiency Status Report". Contractor engineering had closed out engineering on the problem with a recommendation to furnish a FSN 1730-294-8883 platform as a Non-Figure A item. This engineering closed on 8 August, 1963.

The above recommendation was not realized and contractor engineering has been re-released on 8 October, 1963 to obtain this same Non-Figure A item for use at the MSBs.

6.6.9 Time Analysis

A valid time analysis was run on practically the entire operation. Performance times are as follows:

Time Data 625-6

<u>Function</u>	<u>Specified Time</u>	<u>Actual Work Time</u>	<u>Elapsed Time</u>
Roll Transfer	5.70	3.16	4.33
Missile Emplacement	5.11	4.85	6.15
MGS/CTLI Installation	3.86	3.83	4.30
R/V Installation	3.94	3.21	4.05

The difference between the specified time and the other two columns for the roll transfer is that several steps were not charged to the test. The actual emplacement time was somewhat better than specified because of an experienced crew. The MGS/CTLI and the R/V installations were close but should be better than the specified times because of the advance preparations done by the contractor. The contractor accomplished all preparations prior to driving the Van over the silo, including placement of the wooden work platform. This was used in place of the Elevator Work Cage. This prior work should have speeded both the MGS/CTLI and the R/V installation considerably but helped only in the case of the R/V. This latter actual time is very good, considering that a T.O. V&V exercise was going on during the installation.

The time analysis for this test was performed only for the above four items. These are the major items of a -6 test and do not account for the following:

- a) Checkout of the T-E, the R/V, MGS/CTLI Van and Support Trucks.
- b) Travel time from SMSB to Site.
- c) Penetration of the Site.
- d) Gearcase Motor installed and Launcher Closure Lock retracted.
- e) Installation of the wooden platform and spider staging.
- f) Installation of the raceway covers on the MGS/CTLI.
- g) Continuity and hazardous current checks of the MGS/CTLI cabling.

Contractor personnel accomplished (c) through (g).

6.7.1

Summary

This test consisted of inserting codes into two Launch Control Panels (LCP), a Command Signals Decoder (CSD) and the Volatile Code Packs (VCP), and installing these devices in facilities OO-1A, OO-1B, and OO-07. Boeing Job CCP 874-37/1 had to be worked concurrently with this test since this job supplies authorization to use Boeing equipment and documentation to perform equalization and balance of the intersite status and command lines.

All work at OO-1A, OO-1B, and OO-07 was performed by Boeing personnel. The coding was performed by Air Force personnel at the coding room in OO-Z-32. Waivers were obtained to make the test matrix compatible with the use of Boeing personnel. Contractor documentation and drawings, T.O. 21-SM80A-2-16 and T.O. 21-SM80A-2-17-1 were adequate to support the test. No operational test equipment or technical order procedures exist to perform equalization and balance of the intersite status and command lines.

6.7.2

Test Description

The test was conducted in accordance with the Test Operation Plan. Part of the test was conducted on 23 August, 1963, and part on 24 August, 1963 to allow for resolution of problems caused by open contractor work orders. This test consists of several operations. Air Force personnel performed coding of two launch control panels, a command signals decoder and the volatile code packs, using Air Force T.O.'s and equipment, in the coding room at the OO-Z-30.

No Air Force personnel were involved in the work at the OO-01A, OO-01B, or at OO-07. Boeing personnel performed all launch site installation

6.7.2 Test Description (Continued)

of code devices, cable network configuration, and line equalization and balancing. The two LCPs were transported to OO-1A and OO-1B. One LCP was installed in the Launch Control Console at each facility. The CSD and VCP's were transported to OO-07. The CSD was installed in the Sequential Timer Drawer of the Programmer Group. The VCP's were installed in the Decoder Drawer (402A5/A6) of the Status-Command Message Processing Group. Network Configuration was performed to interconnect OO-01A, OO-01B and OO-07 using Boeing Drawings 25-32529, Sheets 1 and 34. Intersite Status and Command Line equalization and balance were performed. An SCN test was initiated from OO-01A and OO-01B to OO-07.

6.7.3 Equipment and Facilities Evaluation

No equipment and facility deficiencies were noted during that portion of the test evaluated.

6.7.4 Human Engineering Evaluation

No new human engineering problems were noted.

6.7.5 Technical Order Evaluation

The following technical order deficiencies were observed.

TO-69 Delete Step 2, page 10 of checklist 21-SM80A-CL-2-16-1 (17 June, 1963) to correct checklist.

Conclusion: Step 2, page 10 of checklist 21-SM80A-CL-2-16-1 is unnecessary.

Recommendation: Delete Step 2, page 10 of checklist. Air Force shop personnel submitted an AFTO 22 #394MS-63-239.

(Approval date 25 June, 1963)

TO-70 Two steps should be added on page 21 of checklist 21-SM80A-CL-2-16-1 (17 June, 1963) and Para. 2-41, step d of T.O. SM80A-2-16 as follows:

Sub-function selector to verify CSD Positioned_____

Code Selector to fire position Positioned_____

Conclusion: Information needed for clarity.

Recommendation: Add Steps 3.1 and 3.2 on page 21 of checklist.
Add the steps to "b" paragraph 2-41 of T.O.
SM80A-2-16.

(An AFTO 22 number 2-8504-2-101 was written by Boeing personnel. This AFTO contains the same information as AF. 22 No. 394MS-63-240 which was submitted by the Air Force and disapproved on 25 June, 1963.)

6.7.6

Personnel Requirements Evaluation

Specified Air Force personnel were not used to perform portions of the test evaluated. Therefore, no evaluation of the adequacy of personnel can be made.

6.7.7

Training Evaluation

Training could not be evaluated for operations other than those conducted in the coding room due to non-participation of Air Force personnel. Training is adequate for those Air Force technicians who performed the coding operations.

6.7.8

Safety Evaluation

No safety hazards were noted during this test.

6.7.9

Time Analysis

No meaningful time analysis is possible.

6.8.1

Summary

This operation consists of establishing the azimuth of the secondary reference mirror, fine indexing the autocollimator, fine indexing the missile, filling and verifying the MGS (Missile Guidance System) and performing missile start-up with telemetry coverage.

Reflections from overhead lights, awkward sighting positions and other conditions leading toward degradation of optical readings were problems during Test Operation 625-8. No serious delays were encountered during this test. Minor equipment and technical order problems were noted. Air Force personnel require additional training and familiarization with Wing II equipment.

This operation is necessary to an operational missile, except for the closed loop checkout, and will be performed at operational bases.

Test Requirements 2.1.10, 2.1.11, 2.3.18, 3.1.1, 3.1.2 and 3.1.4 of BSD-TR-63-29, Volume II, "Wing II Test Program Plan", were accomplished during this operation.

6.8.2

Test Description

Test Operation 625-8 was conducted at 00-07. The operation was performed by Air Force personnel and was verified by contractor personnel.

The test started at 2000 hours on 24 August, 1963. The Air Force targeting team arrived and began setting up equipment. At 2130 hours the Air Force team started to determine the azimuth of the secondary mirror. The task was finished at 0130 hours on 25 August, 1963. The Air Force team took down their equipment and contractor personnel set up a different set of equipment. The contractor team checked the results of the Air Force team, completing their calculations at 0815 hours on the 25th of August. The test was then recessed until 0800 hours on 26 August, 1963.

6.8.2 Test Description (Continued)

Test Operations were resumed at 0800 hours on 26 August, 1963. The Air Force team arrived at 0855 short some equipment. While contractor personnel were locating equipment, the Air Force team proceeded with their preliminary work. The missile was aligned and prepared for start-up. On 27 August, 1963, the C-24D was hooked up and the maintenance tape was run. After successfully finishing the maintenance tape, the program tapes were installed and the computer was filled and verified. Instrumentation was being installed in the launch tube at this time, so the test was continued the following day, reaching Strategic Alert at 2353 hours on 28 August, 1963.

6.8.3 Equipment and Facilities Evaluation

Six equipment deficiencies were noted during conduct of this test. In addition, one discrepancy occurred, in that six 1.5 volt lantern batteries were used to power the optical targets instead of the Figure 'A', 1.5 volt alkaline batteries, which were not available.

E-32 The incandescent lights near the bench rail produce reflections in the theodolites and reference mirrors. Infrared radiation from these lights causes one side of the theodolite to heat more than the other necessitating excessive releveled. Individual switches for these lights have not been provided, and to turn off an individual light it is necessary to unscrew the bulb.

Conclusion: The reflections cause eye fatigue and distract the theodolite operator. Releveling wastes time. Unscrewing bulbs presents several problems, such as reduced illumination; fixtures are not easily accessible; and the high temperature of incandescent bulbs burns fingers.

Recommendation: Change from incandescent to fluorescent lights in the vicinity of the bench rail, this will reduce reflections and heating. To further reduce reflection problems, switches for the lights should be provided above the bench rail.

E-33 Certain functions during the operation of the MGS maintenance tape are required to be timed. No timing device is provided to check these times.

Conclusion: Personal timing devices cannot be used to the degree of accuracy required, particularly watches without sweep second hands. Continuous time devices such as watches used to time discrete events involve considerable eye movement between the watch and the function indicator, introducing considerable chance for error.

Recommendation: It is recommended that a stop watch be added to the equipment required for use during the maintenance tape, operation.

E-34 The Station "A" position has been moved further from the sighting tube than in earlier configurations. This results in a higher theodolite position at Station "A", making it difficult for a 68" operator to sight through the sight tube.

Conclusion: To operate the theodolite correctly the individual of average, or less than average, height must stand on his toes to sight the theodolite down the tube. Fatigue resulting from this position can lead to inaccurate optical work.

Recommendation: An adjustable height stool be provided for the Station "A" theodolite operator to use as required. This stool should provide a platform capable of adjustment from approximately 5" to 20" above the ground. This stool may also incorporate the type of support needed at the autocollimator bench theodolite stations, see E-35.

E-35 The theodolite operator must assume an awkward position in several of the operations during targeting. These occur when the theodolite line of sight is such that the operator must put his head and/or body over the bench in order to put his eye to the eyepiece and when the line of sight is at a high angle to the horizontal. These conditions occur when the theodolite is directed (a) up the sight tube, (b) at the missile.

The first case (a) is due to the elevated line required. The operator is required either to assume an uncomfortable crouch or use a makeshift stool, usually consisting of the nearest piece of loose equipment of approximately the right size. The second (b) is due to the unavailability of standing space around the theodolite. The operator can assume a normal position directly behind the theodolite for only 180° of theodolite traverse. Over the rest of the traverse the autocollimator bench is in the way, and the operator must lean over the bench to a greater or lesser extent. In order to reach the eyepiece of the theodolite it is necessary for most operators to use a makeshift stand which again usually consists of the nearest piece of loose equipment of approximately the right height.

Conclusion: Accuracy and ability of the theodolite operator are decreased by the awkward and tiring positions required. The use of makeshift stools and stands involves both danger to personnel and the possibility that equipment may be broken or damaged. The theodolite operator's accuracy is improved and he is able to assume a less awkward and fatiguing position if he has a stand available to raise him above the floor.

6.8.3 Equipment and Facilities Evaluation (Continued)

Recommendation: It is recommended that two stands capable of adjustment in height between 5 and 20 inches be provided in the Targeting and Alignment Van. These stands would be usable both at Station "A" and at the autocollimator bench. See E-34.

6.8.4 Human Engineering Evaluation

Deficiencies noted in the Equipment section (E-32, E-33, E-34, and E-35) and Safety (S-15) can be considered Human Engineering problems. In addition, the following was noted:

HE-13 Three vertical, parallel index lines above the MGS window are used to index the missile. The outside lines are separated by approximately 3 and 5/16 inches, but the field of view of the theodolite using the 40 power eyepieces is only approximately 2 and 3/4 inches at that distance. Therefore, the theodolite is able to view only two lines at a time, but no means is provided to distinguish one line from another. Although the 25 power eyepiece gives a field of view slightly wider than the 3 5/16" separation of the outside lines, the outside lines are visible with the 25 power eyepiece only when the theodolite is centered on the middle line.

Conclusion: Errors can result from using the wrong line for indexing the missile. Excessive time is required to make positive identification of the lines.

Recommendation: Add identifying marks to the index lines on the MGS. Arrow decals pointing toward the center line, between the outer lines and the center line, could be applied as long as the decal did not cover any part of an index line. Placement of the decal would not be critical. Local solution is recommended. No formal corrective action will be taken.

Technical Order Evaluation

The following technical order deficiencies were observed during the test:

T.O.-1) Several items were not brought to the LF by the Air Force team, but were needed to accomplish the test. These items were:

1. Theodolite stand, portable
2. Collimator Test Set, CL43 Por Q
3. Collimator Mounting Studs
4. Stopwatch
5. Azimuth (Station A to monument)

Conclusion: These five items are required for the targeting and alignment operation. Items 1 and 2 are included in the equipment list for the Targeting Truck, item 3 is "loose equipment" and part of the autocollimator and item 4 does not have a requirement stated.

Recommendation: It is recommended that the Targeting Truck Equipment list in T.O. 36A12-24-3-1 be revised to include the items listed above, and that these lists be used to inventory the Targeting Truck before departing the SMSA for the LF. Paragraph E-33 discusses the need for a stop watch during this test.

AFTO 22, number A/N PSTE 2-118 has been written.

T.O.-71 The instructions carried in T.O. 21-SM80B-CL-2-1-2, Steps 9 and 12 are reversed. (Reference T.O. 21-SM80B-2-1, Page 2-54, steps o and t.)

Conclusion: Recording data as indicated may result in the collimation error being computed incorrectly.

Recommendation: Replace step 9 with step 12 and replace step 12 with step 9.

AFTO 22, number A/N PSTE 2-102 was submitted.

T.O.-77 Team member columns of 21-SM80B-CL-2-1-1 define team member tasks in too much detail.

Conclusion: Detailed task assignment is not necessary at this level. Some prerogative should be left to the team commander to assign detail tasks considering the limits set by individual crew training. Strict adherence to the checklist will increase time required for targeting and fails to utilize the team to maximum advantage. T.O. 21-SM80B-2-1 does not have team member columns.

Recommendation: Delete the team member columns on checklist 21-SM80B-CL-2-1-1.

AFTO 22, number A/N PSTE 2-104 was submitted.

T.O.-78 The note at the top of page 3-67 following step q of para. 3-28 of T.O. 21-SM80B-2-1 provides a method of coaxialization which is inconsistent with other coaxilization instructions in the T.O.

Conclusion: The note in question is incorrect.

Recommendation: Delete the note.

AFTO 22, number A/N PSTE 2-105 was submitted.

T.O.-79 Air Force Targeting and Alignment personnel reported the following objections to the MAW #1 (Mirror Azimuth Worksheet Number 1):

1. The space provided for data recording and calculations is small and crowded.
2. Subtraction operations required by steps 4, 5, 9, 10, and 12 of the instructions involve terms separated by several lines; these lines contain other data.
3. Excessive time is required to make calculations using the MAW #1. (Approximately 4 hours were required on this test.)

Conclusion: The MAW #1 is incorrectly designed for easy, error-free computation.

Recommendation: 1. Increase the size of the MAW #1.

2. Wherever addition or subtraction is required, adjacent blocks should be provided if the quantities involved are not already entered in adjacent blocks.
3. A calculator (Friden or equivalent) should be provided in order to both expedite calculation and reduce errors.

AFTO 22, number A/N PSTE 2-123 was submitted to correct this.

T.O.-51 T.O. 21-SM80B-2-1 does not reference T.O. 21-SM80A-2-3 for use of the LF Start-up Unit when it is impractical to use the C-24D Alignment and Targeting Set. This occurs when the collimator is being aligned to the transfer mirror, requiring site power, but electrical alignment and targeting are not scheduled for several hours.

Conclusion: It is desirable to have an alternate LF Start-Up procedure readily available.

Recommendation: Revise the note at the top of Figure 4-7, 4-8, and 4-8a, T.O. 21-SM80B-2-1 be revised to read:

NOTE:

Site power must be on to align the collimator to the transfer mirror. Refer to T.O. 21-SM80A-2-3 for LF Start-up Unit instructions if a delay is expected between collimator positioning and the use of the C-24D for alignment and targeting.

AFTO 22, number A/N PSTE 2-125 was submitted to revise this note.

T.O.-36 Centering the bubble on the portable theodolite stand centers the theodolite platform over the punch mark which is the surveyed position for Station "A". No requirement does or should exist for the base of the portable theodolite stand to be level. Raising or lowering the platform will move the theodolite platform center away from the Station "A" location if the theodolite stand base is not level. T.O. 21-SM80B-2-1 does not specify that the platform level be checked if it is raised or lowered after mounting the theodolite.

Conclusion: If this level is not checked, inaccurate measurements may result due to translation of the theodolite platform center as a result of nonverticality of the theodolite stand outer casing.

Recommendation: Insert a note after step f, Figure 2-31, Page 2-43, T.O. 21-SM80B-2-1 as follows:

"Each time the portable theodolite stand is raised or lowered, check the level as illustrated in Figure 2-28, steps c through h."

AFTO 22, # A/N PSTE 2-107 has been submitted.

T.O.-48 Transfer mirror instability is a continuing source of alignment error in Wing II. A major source of this instability is due to differential expansion between mirror surfaces with temperature changes. No instructions are in T.O. 21-SM80B-2-1 to permit the transfer mirror to stabilize after installation, although a 30 minute period for temperature stabilization of theodolite is required.

Conclusion: Due to experiences with mirror variation due to temperature fluctuations it is desirable to reduce temperature changes of mirrors during use as much as possible. -

Recommendation: Add the following to T.O. 21-SM80B-2-1, Figure 2-13.

"g. Permit temperature stabilization of the transfer mirror for a minimum of 30 minutes after installation."

AFTO 22, # A/N PSTE 2-115 has been submitted.

T.O.-52 The missile retargeting sequence in T.O. 21-SM80B-2-1, Figure 3-1, does not include a step to "Establish Reference Mirror Azimuth." The instability of Reference Mirror Azimuths over an extended period has been demonstrated at VAFB in several launch facilities.

Conclusion: Variation of the mirror azimuth can cause errors in missile targeting.

Recommendation: It is recommended that a block labeled "Establish Reference Mirror Azimuth" be placed in the targeting sequence, Figure 3-1, T.O. 21-SM80B-2-1 after the block labeled "Shutdown Launcher Power".

AFTO 22, number A/N PSTE 2-116 has been submitted.

T.O.-50 A discrepancy of approximately 10 seconds was found by contractor check personnel following the final positioning of the transfer mirror by Air Force personnel. An appreciable period of time had passed between the time of the Air Force adjustment of the transfer mirror azimuth and the alignment of the collimator to the mirror. The launcher tube door was open during this period.

Conclusion: This transfer mirror has a tendency to drift as a function of time, this tendency is greatly increased when the launcher door is opened.

Recommendation: It is recommended that the collimator be aligned with the transfer mirror within 15 minutes after completion of transfer mirror determination. It is also recommended that the launcher door remain closed during optical angle measurements within the launcher equipment room. After positioning and locking the collimator, changing the launcher door position will not ordinarily degrade the setting.

AFTO 22, number A/N PSTE 2-121 has been submitted.

T.O.-80 Information on the location of the LF equipment room bench sector boundaries at VAFB for Wing II is not readily available to the T&A team. Data is provided at the top of the Wing II launch azimuth work sheets for bench rail sector boundaries for operational sites.

6.8 .5 Technical Order Evaluation (Continued)

Conclusion: Excessive time will be required to determine the bench rail sector boundaries and errors may result.

Recommendation: Add the information identifying the Vandenberg sectors to T.O. 21-SM30B-2-1, and change the launch azimuth work sheets to contain the sector information for VAFB as well as for operational sites.

AFTO 22, numbers A/N VAFB-63-295 to VAFB-63-301, have been written.

6.8 .6 Personnel Requirement Evaluation

The test team as prescribed is adequate for the task.

6.8 .7 Training Evaluation

The following training deficiency was observed.

T- 3 The T&A team members reported inadequate training on the C-24D. Several malfunctions or indications of malfunctions occurred which the team members did not understand and for which they did not know the proper responses.

Conclusion: Lack of training could cause failure of the T&A teams function during the targeting operation.

Recommendation: Training in both operation and troubleshooting the C-24D should be given to the appropriate T&A team members.

AFSC	Rank	Training				
		Type 1	Type 2	OKT	OUT	Other
3124D	Lt	No	Yes	Yes	No	No
3124D*	Lt	Yes	No	Yes	Yes	Yes
31254G	TSgt	Yes	No	Yes	Yes	Yes
44350G	TSgt	Yes	No	Yes	Yes	No

* Substituted for the 31254G during reference mirror azimuth determination.

6.8 .8

Safety Evaluation

One safety deficiency was observed.

8-15 The theodolite stand height adjustment rods are not used after adjustment of the theodolite to the center of the launcher site tube, but interfere with the movement of the theodolite operator around the stand.

Conclusion: The theodolite stand adjustment rods may cause personnel injuries or may cause a change in theodolite elevation if bumped or struck hard.

Recommendation: Unscrew and store the theodolite stand height adjustment rods after the theodolite is set up, replacing them on the stand when the Station "A" operations are complete. The rods are threaded into the drive wheel and are easily removed and replaced manually.

AFTO 22, number WII/TF-63-26 has been submitted.

6.8 .9

Time Analysis

The following are observed times for functions completed and observed during this test.

FUNCTION	OBSERVED TIME IN HOURS	TOTAL ELAPSED TIME IN HOURS (DATES)
Enter LF Enclosure and Soft Support Building	.12	.12 (8-24)

FUNCTION	OBSERVED TIME IN HOURS	TOTAL ELAPSED TIME IN HOURS (DATES)
Position Targeting Truck at Launcher	.08	.03 (8-24)
Lower Equipment	.16	.16 (8-24)
Install Theodolite Mount	.10	.10 (8-24)
Install theodolite	.20	.20 (8-24)
Temperature Stabilize theodolite at Collimator Bench	.50	} Simultaneous Operations .50 (8-24)
Set Up theodolite Stand and Mount theodolite	.50	
Install Targets	.30	
Perform Collimation Error Check	.45	.45 (8-24)
Measure Angles A/B, C/D and Vertical Angles	2.60	2.60 (8-25)
Compute Angles A/B and C/D	3.50	3.75 (8-25)
Lower equipment for indexing	.56	.56 (8-26)
Install indexing equipment	.16	.16 (8-26)
Rotate Missile	.25	.25 (8-26)
Measure reference angle	.25	.25 (8-26)
Compute reference angle	.16	.16 (8-26)
Measure Missile Offset	.43	.43 (8-26)
Compute missile offset and determine theodolite translation	.92	.92 (8-26)
Position and adjust collimator	.08	.03 (8-26)
Measure collimator vertical offset	.25	.25 (8-26)
Determine and install spacers if needed	.13	.13 (8-26)
Lock collimator in position	.05	.05 (8-26)

FUNCTION	OBSERVED TIME IN HOURS	TOTAL ELAPSED TIME IN HOURS (DATES)
Install Transfer Mirrors	.03	.03 (8-26)
Adjust transfer mirror to T3	.11	.11 (8-26)
Measure angle E/F and correct Transfer Mirror Azimuth as required.	1.25	1.25 (8-26)
Repeat measuring angle E/F and translate Mirror as required.	1.67	2.00 (8-26)
C-21 alignment to Transfer Mirror	.45	1.95 (8-26)
Install G&C Maintenance tape	.05	.05 (8-27)
Turn on C-24 and perform self test	.02	.02 (8-27)
Self test & connect C-95	.12	.12 (8-27)
Turn on G&C Power	.06	.06 (8-27)
Perform Maintenance Tape Sequence	1.75	1.75 (8-27)
Install flight tape and perform sequence	.33	.33 (8-27)
Test discontinued for telemetry repairs	--	-- (8-27)
Repeat turn on C-24 and self test	.02	.02 (8-28)
C-24 Self Test repeated	.02	.25 (8-28)
Fill and verify	.05	.05 (8-28)
Alignment	.26	1.36 (8-28)
Alignment and Test repeated	.25	.25 (8-28)
Command Destruct test at LCF	1.35	1.35 (8-28)
Calibrate	2.58	2.58 (8-28)
TOTALS	22.32	24.73

6.9 TEST OPERATION 625-9 POST EMPLACEMENT REFURBISHMENT AND
REMOVAL OF MISSILE SAFING PINS

6.9.1 Summary

This report covers the installation of ordnance items for the launcher closure and umbilical retract mechanism, final launcher sealing and removal of missile safing pins for FTM 625 at 00-07. Post launch refurbishment for FTM 658 was accomplished during this test. No major problems were encountered during the test. Only one deficiency was noted. This is covered in the Safety Evaluation. No time evaluation was made due to interference between this test and the targeting operation. However, all functions for this test were performed in a satisfactory manner.

6.9.2 Test Description

Prior to working the post emplacement refurbishment, post launch refurbishment was accomplished for FTM 658 (658-12). The missile suspension system was not refurbished after the launch of FTM 658 because of scheduling difficulties.

The final launcher sealing included the launch tube access door, elevator access door, MGS umbilical retract box, removal of the azimuth drive motor and final application of PR 1955 sealant.

Ordnance installation included hazardous current tests of cables before they were connected to live ordnance.

Missile and CTLI safing pins were removed by Air Force personnel by use of a crane and spider staging.

Test Operation 625-9 began at 1530 hours on 23 August, 1963, and was completed at approximately 0900 hours on 29 August, 1963. All work except the pulling of safing pins was performed by Contractor personnel.

6.9.3 Equipment and Facility Evaluation

No new Equipment and Facility deficiencies were noted.

6.9.4 Human Engineering Evaluation

One human engineering problem was noted, and is reported under Safety Evaluation because of the safety implications.

6.9.5 Technical Order Evaluation

No significant T.O. deficiencies were observed during this operation.

6.9.6 Personnel Requirement Evaluation

No evaluation of personnel requirements was considered as all functions observed were performed by contractor personnel.

6.9.7 Training Evaluation

No evaluation of personnel requirements was considered as all functions observed were performed by contractor personnel.

6.9.8 Safety Evaluation

S-12 The test cables of the explosive set circuitry test set, A/E 25T-1 (Figure A 3007), are too short to permit the placing of the test set either on the floor or on the collimator bench. This condition requires the operator to support the test set with one arm, while standing with one foot on the autocollimator bench and the other foot on the top of a four-foot step ladder. This condition did not permit other personnel to verify the hazardous current test set reading (Safety Monitor Function).

Conclusion: Cables of test set A/E 25T-1 (Figure A 3007), are too short.

Recommendation: Design Engineering has been informed of this problem. It is recommended that they lengthen the test cables by 6 feet and specify a new calibration and/or usage procedure.

6.9.9 Time Analysis

No meaningful time analysis is possible.

6.10.1 Summary

Test Operation 625-10A was conducted on 29 August, 1963, in preparation for the launch of FTM 625 from CO-07. All functions were performed by contractor personnel; Air Force personnel did not participate in the operation. No difficulties were encountered and the weapon system was prepared for launch within a one hour period.

6.10.2 Test Description

The test operation consisted of (1) removing the safety control switch locking device to allow the switch to be electrically set to the arm position from the HLCF (2) removing the green (safe) CTLI ordnance plug (3) installing the red (arm) CTLI ordnance plug and (4) removing the autocollimator slot safing pin. After the above operations the facility was cleared of all unnecessary equipment and secured. Standby power had been applied earlier so that it could be on for 10 hours prior to launch as required.

No problems were encountered during the test operation.

610.3 Equipment and Facilities Evaluation

Equipment and facilities used to support the test were adequate. No deficiencies were observed.

6.10.4 Human Engineering Evaluation

No human engineering deficiencies were observed.

6.10.5 Technical Data Evaluation

Technical data was adequate to support the test.

6.10.6 Personnel Requirements Evaluation

No evaluation was made since the QPRI specifications were not used.

6.10.7 Training Evaluation

Since the Air Force did not participate, this evaluation does not apply.

6.10.8 Safety Evaluation

No hazardous conditions were noted during conduct of the test.

6.10.9 Time Analysis

The facility was enabled within a one-hour period by contractor personnel.

6.11	<u>TEST OPERATION 625-10</u>	<u>SYSTEMS CHECKOUT</u>
	<u>TEST OPERATION 625-11</u>	<u>LAUNCH OPERATIONS</u>

6.11. Summary

Test Operation 625-10, Systems Checkout, was performed on 28 August, 1963, by Air Force personnel (with Contractor assistance) using technical order procedures. Test requirements established by BSD-TR-63-29, Volume II, "Wing II Test Program Plan" which were to be satisfied by this test operation are as follows:

<u>Test Requirement Title</u>	<u>Test Requirement Number</u>
CTLI Preparation for Countdown	2.3.17
Preparation for Open Loop Checkout (Ground Power)	2.3.19
Open Loop Checkout (Ground Power)	2.3.20
Continuous Monitoring	3.1.4
SCN - Test Operations	3.1.2

The five test requirements were met satisfactorily.

Test Operation 625-11, Launch Operations, was performed at 00-07 on 29 August, 1963, by Air Force personnel using technical order procedures. Test requirements established by BSD-TR-63-29 are as follows:

<u>Test Requirement Title</u>	<u>Test Requirement Number</u>
CTLI Preparation for Countdown	2.3.17
Preparation for Open Loop Checkout (Ground Power)	2.3.19
Open Loop Checkout (Ground Power)	2.3.20
Preparation for Open Loop Checkout (Airborne Power)	2.3.21
Open Loop Checkout (Airborne Power)	2.3.22
SCN - Test Operation	3.1.2
Continuous Monitoring	3.1.4
FTM Launch Operations #2	4.1.5*
CTLI Launch Countdown	3.2.1
CTLI Launch Sequence Termination	3.2.2
Missile Flight	3.2.3

* Revised by Coordination Bulletin VWTM-210

All of the above test requirements were met except test requirement numbers 4.1.5 and 3.2.3, which were partially met. For an analysis of missile flight, refer to Launch Demonstration - FTM 625, T2-3200-2 (Secret).

6.11.2 Test Description

Systems Checkout, test operation 625-10, was performed on 28 August, 1963, to verify readiness of the CTLI system to support launch operation 625-11. Open loop checkouts of the C-Band Beacon, Telemetry, and Command Destruct systems were made with the CTLI system on ground power. The open loop checkouts were made to evaluate the Telemetry output, determine trackability of the C-Band Beacon and to check the primary and secondary command destruct transmitters.

During Systems Checkout the Telemetry transmitter failed and, to minimize downtime, the TM transmitter was replaced in the silo without removing the mated G&C/CTLI Sections. It is noted that CTLI wafer component removal was contrary to established maintenance criteria (Ref. D2-11371, Rev. 5 dated 5-29-63). The range then reported that the telemetry signal was satisfactory and the C-Band Beacon was trackable with a signal strength of 22 db although there were many reflections up to 15 db. Checkout destruct signals were received from both the primary and secondary command destruct transmitters.

The test was performed by Air Force personnel using procedures outlined in technical orders 21-SM80A-1 and 21-SM80A-1-1.

Launch Operations, test operation 625-11, began at 1440 hours on 29 August, 1963 and was completed at 1617 hours with the launch of FTM 625.

Open loop checkouts of the CTLI were made on ground power and airborne power. These checkouts consisted of an evaluation of the C-Band Beacon and telemetry and of destruct checks using the primary and secondary command destruct transmitters. The test was conducted with the LF and LCF's operating on standby power which had been applied approximately ten hours prior to launch. The CTLI was satisfactory.

Instrumentation was provided and data collected for CCP 1255, Simulated Vented Cavity Test.

Target selection capability was demonstrated by switching from target 2 to target 1, then back to target 2. VRSA interrogation (at both the SLCF and HLCF) indicated that the target switching operation was satisfactory. The missile was launched to target 2.

During LF enabling, test operation 625-10A, a security system fault (VRSA channel 34) occurred and it was found to be impossible to reset the inner and outer zone security alarms from the HLCF. After review of the situation by the Command Team, the decision was made to conduct test operation 625-11 with the inoperative security system.

The countdown procedures were normal until T-2 minutes when the C-Band Beacon signal was lost by the range. The count was recycled to T-6 minutes and a hold was called until the problem could be solved. The range performed an equipment check and could find no irregularities. A beacon evaluation check was performed and the range reported that the beacon was again trackable. Due to limited CTLI battery life, the decision was made to transfer to airborne power at T-2 instead of T-5. First stage ignition and Missile Flyout were normal. See Flight Test Report, FTM 625 for remainder of flight information.

6.11.3 Equipment and Facilities Evaluation

The security subsystem at OO-07 malfunctioned during test operation 625-10A, LF enabling. Inner zone and outer zone violation indications were present after the area was secured and it was not possible to reset them. Cause of the malfunction was not investigated and the test requirement to launch with the Security Subsystem operating was waived.

Loss of the C-Band Beacon signal was reported by the range at T-2 minutes of the terminal countdown. The signal had been evaluated earlier and was trackable with a signal strength of 30 db. After a recycle of T-6 and another interrogation of the beacon, it was found to be satisfactory. Cause of the temporary loss of signal was not determined.

6.11.4 Human Engineering Evaluation

Personnel under test performed their functions satisfactorily with no difficulties due to environment, procedures, safety, logistics or equipment configuration (physical).

During LF enabling, test operation 625-10A, a security system fault (VRSA channel 34) occurred and it was found to be impossible to reset the inner and outer zone security alarms from the HLCF. After review of the situation by the Command Team, the decision was made to conduct test operation 625-11 with the inoperative security system.

The countdown procedures were normal until T-2 minutes when the C-Band Beacon signal was lost by the range. The count was recycled to T-6 minutes and a hold was called until the problem could be solved. The range performed an equipment check and could find no irregularities. A beacon evaluation check was performed and the range reported that the beacon was again trackable. Due to limited CTLI battery life, the decision was made to transfer to airborne power at T-2 instead of T-5. First stage ignition and Missile Flyout were normal. See Flight Test Report, FTM 625 for remainder of flight information.

6.11.3 Equipment and Facilities Evaluation

The security subsystem at 00-07 malfunctioned during test operation 625-10A, LF enabling. Inner zone and outer zone violation indications were present after the area was secured and it was not possible to reset them. Cause of the malfunction was not investigated and the test requirement to launch with the Security Subsystem operating was waived.

Loss of the C-Band Beacon signal was reported by the range at T-2 minutes of the terminal countdown. The signal had been evaluated earlier and was trackable with a signal strength of 30 db. After a recycle to T-6 and another interrogation of the beacon, it was found to be satisfactory. Cause of the temporary loss of signal was not determined.

6.11.4 Human Engineering Evaluation

Personnel under test performed their functions satisfactorily with no difficulties due to environment, procedures, safety, logistics or equipment configuration (physical).

6.11.5 Technical Data Evaluation

Documentation used to support the test was adequate.

6.11.6 Personnel Requirement Evaluation

Personnel demonstrated adequate judgmental skill and working knowledge in the operation of weapon system hardware associated with the test.

6.11.7 Training Evaluation

Individual and team capability indicated adequacy in the performance of test operation 625-10.

Three occurrences which have training implications were noted during test operation 625-11:

- a. After recycling to T-6 minutes and safing the enabling switch, the crew did not know whether or not one or two additional launch commands would be required to launch the missile.
- b. The crew members had to be reminded to return the launch switch to the CODE USED position as required by T.O. 21-SM80A-1, para. 3-36, step 11.
- c. The LAUNCH COMMANDED caution lights were not reset as required by para. 3-36, step 19.

6.11.8 Safety Evaluation

No safety problems were observed during the test.

6.12.1 Summary

Test operation 625-12 fulfilled the requirement to restore the LF to full operational capability, including CTLI.

The operation consisted of the following basic steps:

- a. Perform a safety inspection of the LF immediately after firing.
- b. Perform a damage inspection to determine the extent of refurbishment and restoration necessary.
- c. Perform the post-launch refurbishment.
- d. Perform pre-launch tests and refurbishment.

Observation of the preceding steps led to the following conclusions:

a. Equipment

Deficiencies exist in the equipment used in refurbishment of the Suspension and Alignment System and in the cabling furnished for the hydraulic test bench (Type D-6A). These deficiencies were present and reported on during previous refurbishment tests and will only be mentioned in this report. The paperwork connected with spares provisioning caused several delays in the operation. Installation or removal of equipment through the operation must be done as a series of tasks because of cramped quarters. Since these tasks cannot be done concurrently, little decrease in the overall time required for refurbishment is anticipated.

b. Technical Orders

The technical orders, in general, were adequate for the operation but require some changes affecting removal of the ballistic actuator assembly and installation of the launcher closure cables.

The use of contractor personnel, instead of stipulated Air Force personnel, during this operation negates evaluations of personnel

requirements and training and a formal time analysis. These evaluations and the time analysis are pertinent only when Air Force personnel perform the test operations.

6.12.2 Test Description

Refurbishment of 00-07 began 29 August, 1963, and ended with the emplacement of FTM 695 on 24 September, 1963. The purpose of the test operation is to restore the LF to full operational capability, including CTLI, in preparation for the next missile emplacement.

Inspection revealed that the following damage was sustained by the LF during the launch of FTM 625:

- a. Two CTLI skirt umbilical cable clamps blown off.
- b. Two security system transducers ruined.
- c. All umbilical cabling to missile skirt burned.
- d. Crystallization of the fingers of the lid removal multiplying linkage. (This may be accumulated damage.)
- e. Two temperature transducers ruined.

The necessary action was taken to correct the damage done during the launch and refurbishment was completed to pre-emplacment condition on 23 September, 1963.

6.12.3 Equipment and Facilities Evaluation

Equipment and facilities were adequate for this operation except in two cases which have been encountered and reported on for previous refurbishment tests. They are:

- a. Equipment and detailed procedures for removal of the three sheave assemblies of the Suspension and Alignment System are not specified in the technical data. Consequently, methods used for the removal of the sheave assemblies are left to the discretion of the personnel assigned to do the job. This deficiency is carried as E-15 in the Deficiency Status Report of the #5 Wing II Monthly Summary Report.

- b. The hydraulic service unit, ACO 3056, used in the suspension system load test is used elsewhere and does not always arrive at the site with a cable plug that will fit the site power receptacles. An ACO cable adapter is being fabricated locally on an engineering request. Assembly of the cable adapter is being delayed, awaiting receipt of one of the component connectors. Anticipated delivery date for the connector is 18 October, 1963. This problem is carried as E-18 on the Deficiency Status Report of the #5 Wing II Monthly Summary Report.

6.12.4 Human Engineering Evaluation

No human engineering deficiencies were noted during refurbishment.

6.12.5 Technical Order Evaluation

The following discrepancies were observed in the procedures used during the operation:

T.O.-57 Installation procedures for the launcher closure cables as called out in T.O. 21-SM80A-2-11, Paragraph 4-26, Step "a", and Figure 4-9 are confusing in that Figure 4-9 does not clearly differentiate between the two cables. It refers to the cables as cable assembly (left lay) and (right lay).

Conclusion: Differentiation between the cables is not clear because of a use of a ropemaking term which is unfamiliar to personnel.

Recommendation: Change references in Figure 4-9 from "left lay" and "right lay" to part numbers.

AFTO 22 No. WII/TF-63-22 submitted.

T.O.-58 Procedures for the removal of the ballistic actuator are confused as a result of deficient instructions in T.O. 21-SM80A-2-11, Paragraph 4-17, Step "f". This step removes

only the inner support plate, not both plates, and leaves too small an opening for fitting the actuator removal harness through the upper equipment room floor.

Conclusion: Removal of only one support plate results in substitution of a make-shift lash-up about the actuator, to accomplish its removal, in place of using the specified harness.

Recommendation: Change Step "f", Paragraph 4-17, to remove the bolts in the two support plates so that the plates may be removed, one at a time, and a large enough opening be provided to allow use of the specified actuator harness for removal of the ballistic actuator.

AFTO 22 No. WII/TF-63-23 submitted.

6.12.6 Personnel Requirements Evaluation

Due to the use of contractor personnel no evaluation is possible.

6.12.7 Training Evaluation

Due to the use of contractor personnel no evaluation is possible.

6.12.8 Safety Evaluation

S-13 Use of a portable pump which has a switch at the pump is a safety hazard when removing water from the bottom of the silo. Reports have been received that the workmen have received mild electrical shocks while controlling the pump.

Conclusion: Control of a pump at the bottom of the silo should not be exercised by the workman at that location.

Recommendation: Control of this pump may be accomplished at the power source in the LFEB. This will require a man at the LFEB power source and a man at the silo edge - using headsets. Further study will be made.

6.12.9 Time Analysis

The use of contractor personnel during the test precludes formal analysis.

The refurbishment period extended from the second shift on 29 August, 1963, through the second shift on 23 September, 1963, with no Sunday work and very little Saturday work. The lengthy time required was due to the restricted quarters, especially at the bottom of the silo, frequent interruptions in crane service, occasional late arrival of equipment, and paperwork problems. Refurbishment is, necessarily, a series of jobs accomplished by several different crews. This lack of concurrency in the performance of jobs results in a time and manpower waste, and no relief from the situation is foreseen.

LOGISTICS

Vandenberg testing has been primarily directed at performing and evaluating certain scheduled activities associated with missile processing to achieve strategic alert. Unscheduled maintenance has generally been accomplished by Contractor personnel using Contractor documentation. Consequently there has been very little evaluation of the adequacy of the technical orders to aid in the solving of maintenance problems.

7.1

Spares

The Spares provisioning appeared to be adequate for these tests. Four (4) Electrical Cable Assembly Sets, P/N 25-26875-5 were rejected during the CTLI installation. Action has been taken to investigate the problem for possible corrective action.

7.2

Refurbishment

Limited "over-the-shoulder training" of AFLC (SBAMA) personnel has been conducted on the refurbishment of LF-07. Three SBAMA supervisory personnel received this OJT training; two on days, one on night shift. This training is considered inadequate because of the close quarters in the silo with which these personnel had to observe refurbishment operations. The silo space limitations and crane capability are not conducive for adequate OJT. Training should be conducted by Air Force personnel actually performing the refurbishment task under contractor direction.

In addition to training, Air Force personnel are required, as items-in-test, to satisfy program objectives in accordance with the R&DT ever increasing user concept. It is believed that the twenty-seven (27) refurbishment program objectives cannot be fully satisfied if Air Force personnel do not actually perform refurbishment after the FTM 695 launching. The confidence factor of achieving refurbishment test objectives with using only contractor personnel must be considered somewhat less than 100% because of a non-operational (VAFB Peculiar) environment.

7.3

Illustrated Parts Breakdown (IPB) T.O. 21-SM80A-4-1

Review of those parts replaced, as a result of unscheduled maintenance reflected no discrepancy or omission in the IPB (those items in the Operational Inventory).

7.4

T. O. 21-SM80A-18

Evidence still exists that the Contractor is taking "in-house" MRB action rather than following Technical Order maintenance disposition. This action is prevalent in the installation of CTLI equipment. When MRB action is required AFTO Forms 22 should be submitted.

7.5

T. E. Tractor

The T. E. Tractor starter ring gears are exhibiting a shearing of teeth. At least three (3) have failed indicating a possible problem. The Fifth Wheel Actuator and limit switch continue to fail with at least seven (7) failures recorded. It is suggested that the appropriate AMA Monitor for additional failures.

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A P P E N D I X A

Deficiency Status Log

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Deficiency Report No.	Abstract of Deficiency	Test No.	T.R. No.	Fig. A Reference	T.O. Reference	Recommendation / Status	Resulting Action
E-1	Suspected inadequate emergency lighting in munitions facility bay area	021-5	2.1.1 2.3.21			AVCO Engineering investigation. Problem turned over to Air Force for resolution. Air Force deems lighting adequate	VAR
E-2	Lack of torque wrench croofoot adaptor for torquing in-flight separation connector switch in P-38	021-5	2.1.1 2.3.31	6146	11R-RV11-2	Item will be on hand for future tests.	VAR
E-3	P/W shipped with small pre-ordered hardware shortages.	021-5	2.1.1 2.3.31	6146	11R-RV11-2	Shortages filled from Spares inventory	VAR
E-4	Shorting plugs were not supplied with attitude control rockets and a tube	021-5	2.1.1 2.3.31		11R-RV11-2	Shorting plugs should be supplied for prop r training.	VAR
E-5	Space restriction in torquing one of the P/W Speeder Ball locknuts	021-5	2.1.1 2.3.31	6146	11R-RV11-2	Failure Report filed; recommendation to increase space or reduce wrench size. Space has been increased.	Accomplished
E-6	WPT in Fig. 6-23 of T.O. (rail retainer, item 4) states to torque 5 1/2 in. lbs. Torque can not be achieved without special wrench - adapter C-End Beacon signal strength varied from 0 to 36 db.	658-6	2.1.7	038	ZI-S900A-2.2	These torque values not critical. Re-issued obliterating instructions on retainer. Eliminated from T.O. T.O. but not retainer. Cost too high.	ACCOMPLISHED
E-7	Loose concrete at base of theodolite stand (Station A) causes erratic readings.	658-10	2.3.20	6162	ZI-S900A-1.1	Additional wing II investigation in progress. Additional investigation indicates isolated malfunction.	VAR
E-8	Wing II W33 "P" Taps not yet submitted by Change Board (Ames). Wing I tape substituted.	658-8	2.1.10	10738	ZI-S900A-2.1	Reeling PWB 950 - Replaced concrete securing the plate studs.	ACCOMPLISHED
E-9	5'-35' Cable connecting lower cable clamp to CII W-fer is 1/2" too short.	658-4	2.3.9	10010	ZI-S900A-2.17.1	PCP substitute (339). No POD established. Type now available.	VAR
E-10	Outplate inserts fall during recovery cover alignment and installation.	658-4	2.3.8	6215	ZI-S900A-2.17.1	APTO 22 (W11/T-63-2) has been submitted.	APPROVED
E-11	Curves transfer of 512V from aircraft to EMT, the rear and guide on SGM hit guide rail on P/W	658-3	2.3.11	6404	ZI-S900A-2.17.1	A heavier outplate assembly should be used in this area. Re-investigation shows training is eliminating this problem.	VAR
E-12	Configuration of CII uniliter bracket on Base Adapter Ring made mating impossible.	658-18	2.3.1	4095	ZI-S900A-2.17.1	Further evaluation is required. Investigation in process.	VAR
E-13	Ground strap to ground GAC Section to third star engine was too short	658-6	2.3.12	1252	ZI-S900A-2.22	IC TCP 630 initiated.	ACCOMPLISHED
E-14	Special sheave-removal tool (P/W 29-2459) not available for test.	658-6	2.1.8	None	ZI-S900A-2.22	Further evaluation will be made. No difficulty experienced during 870-6.	VAR
E-15	Installation and removal time for the Wing II suspension system is unnecessarily long.	658-12	2.3.24	1322.2	ZI-S900A-2.18.1	Action will be initiated to procure special tool. New procedure for proving sheaves is being developed.	VAR
E-16	Clearance between gusset plates at base of suspension spring can be too small to allow removal of tie-down bolts with standard socket wrench	658-12	2.3.24	1322.2	ZI-S900A-2.18.1	Provide an access hole so that tension bars and the role can be connected easily. T.O. 611-1 PD (P-38) dated 27 July 1963.	Local modified accomplished
E-17	Connector on power cable for hydraulic cert valve not mate with 220V outlet at top of launch tube.	658-12	2.3.24	1322.2	ZI-S900A-2.18.1	Increase the dimension between gusset plates and tie-down bolts so that standard socket can be used.	ACCOMPLISHED
E-18	Not reported in Final Ground Test Report - PTM 656, but will be included in subsequent reports.	658-12	2.3.24	None	3312-6-51	Adapter cable should be provided to allow power for hydraulic cert to be taken from receptacle at top of launch tube. This is being done by the P-38.	ACCOMPLISHED

Not reported in Final Ground Test Report - PTM 656, but will be included in subsequent reports.

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Deficiency Report No.	Abstract of Deficiency	Test No.	TR No.	Fig. A Reference	T.O. Reference	Recommendation / Status	Resulting Action
E-19	Installation of the Missile Suspension Loading Fixture, ACD 216, was difficult due to lack of proper tools.	658-12	2.3.24			Add two cross foot wrenches to auxiliary equipment. TRU will be written. Memo written to Hqs. Engr. in lieu of tool. Add 2 wrenches to tool kit.	Existing Work-around tools sufficient - OK
E-20	Suspension system components which undergo post-launch stress analysis are not certified.	658-12	2.3.24			Serialize and keep records on suspension system parts. Further investigation in process. Report between Engineering and Production Divs.	NA
E-21	During assembly of ACD 126 Missile Suspension Load Test Fixture, nose plate location interfered with mating of rod assembly to hydraulic actuator.	658-12	2.3.24			Change location of nose plate for rod assembly. ERT will be submitted. Memo to Hqs. Engr. written instead (2.11.65-55-001) requesting relocation of nose plate.	
E-22	RT/CAC Trailer front doors cannot be closed if van is connected to site power.	021-11A	2.1.24	4024	21-9404-2-8	Further investigation reveals no problem.	NA
E-23	The six size D dry cell batteries have insufficient life to power optical targets used on monoculars. Re-lacquer during angle measurements causes time delay.	658-8	2.1.10 2.1.11	512	21-9404-2-1	Differential battery pack should be used to provide greater safety factor. A/V is investigating the problem. Change T.O. 21-9404-2-1 for 2-1. Write following step g to use Evershield alkaline battery E95 or equiv.	ACCOMPLISHED
E-24	Cables do not wind evenly on BPT drums during C-1133 on/off loaders. This results in cable bunching and excessive wear.	021-1D		4200	21-9404-2-2	Additional investigation in progress.	
E-25	Difficulty was experienced in electrically setting the R/V to the RSM.	021-6		4043	3544-2-31-1	Further evaluation in progress.	
E-26	C-21D will not turn on site power as presently configured.	021-7				Action request has been submitted to Directorate, A-11. ECP # 45-133A-AV-457 issued.	
E-27	Relinquer flowed along 322B stiffener grooves, emptying inside the DP18.	021-1D		4095	21-9404-2-17-1	V/F: unique - avoid roll transfers in heavy rain when possible	NA
E-28	Cable P/W 25-2021-1 should not be LF equipment. It is used for C/D SFA checkout in the DP1P.	021-3				Make cable part of BPT equipment or supply an additional cable.	
E-29	MCS Coolant System deficiency	021-12				Reference MCS Cooling Test (D plus 14 Dry Report) T-1162-2	
E-30	Fig. A 4105 may not have sufficient gas pressure for repeated opening of launcher closure			4305	21-9404-2-10	Fig. A 4105 be used only for retracting closure lock and that lock be held down for sufficient time to complete operation. Recheck and adjust.	Approved
E-31	Fabric of Environmental Cover (Fig. A 4095) is in deplete for use as it tears too easily. TUB peculiar item.	021-1D		4095	21-9404-2-17-1	Design to eliminate repair need re-align. Suggests leave repair with any suitable material.	NA

* Not reported in Final Ground Test Report - FTM 658, but will be included in subsequent reports.

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Deficiency Report No	Abstract of Deficiency	Test No	I.R. No	Fig. A Reference	T.O. Reference	Recommendation/Status	Resulting Action
T.O.-1	T.O. does not contain instructions for LICO to query WSA and report channels to LD	658-11	2.1.13		21-SM0A-2-17-1	APTO 22 VII/77-63-1 submitted.	DISAPPROVED
T.O.-2	Fig. 4-9 of T.O. is incorrect as drawn with regards to inset drawing of the output cable installed. T.O. as pipe is in one place	658-4	2.3.10		21-SM0A-2-17-1	APTO 22 VII/77-63-2 submitted.	APPROVED
T.O.-3	Heat pipe per para. 3-17e cannot be repositioned per T.O. as pipe is in one place	658-12	2.3.24		21-SM0A-2-17-1	APTO 22 VII/77-63-3 submitted. Hold for BPTC review.	DISAPPROVED
T.O.-4	WAF operations sometimes require reporting G711 batteries while missile is in LP. T.O. procedure is incorrect.	021-64	2.1.15		21-SM0A-2-17-1	APTO 22 VII/77-63-4 submitted.	APPROVED
T.O.-5	Set Power Supply Design Criteria re. R/V test	021-5	2.1.1 2.3.31		21-SM0A-2-17-1	AVCO Technical Publications and Engineering investigating.	
T.O.-6	T.O. is vague in procedure for adjusting R/V Spacer mechanical lagyard	021-5	2.1.1 2.3.31	6146	21-SM0A-2-17-1	AVCO Technical Publications investigating. Corrected in TOCM #1	Approved
T.O.-7	T.O. versus Design Criteria re. Installation of Separation Front Switch in R/V Spacer	021-5	2.1.1 2.3.31	6146	21-SM0A-2-17-1	AVCO Technical Publications investigating. Corrected in TOCM #1	Approved
T.O.-8	T.O. incorrectly identifies R/V Pairing and Body as being Stainless Steel	021-5	2.1.1 2.3.31	6144 6166	21-SM0A-2-17-1	T.O. corrected via TOCM #8.	BAR
T.O.-9	T.O. should call out inspection of Separation Connector tapped hole for barb.	021-5	2.1.1 2.3.31	6139	21-SM0A-2-17-1	Normal QC inspection should eliminate need; AVCO Tech. Publications investigating.	Disapproved
T.O.-10	Access doors from R/V Spacer should be placed in bags when removed	021-5	2.1.1 2.3.31	6146	21-SM0A-2-17-1	AVCO Technical Publications investigating.	Disapproved
T.O.-11	T.O. para. 2-44, step "p" should call out retraction of R/V Pallet handle	021-5	2.1.1 2.3.31	905	21-SM0A-2-17-1	APTO 22 Arco-VAFB 63-19 submitted.	Disapproved
T.O.-12	Removal of Transport Monitor System from missile after roll transfer per T.O. is not compatible with Arco. 5-11-11-1 and Arco. 5-11-11-1 and Arco. 5-11-11-1, function 3.3.	-13		4187	21-SM0A-2-17-1	APTO 22 VII/77-63-5 submitted. Hold for BPTC resolution.	Disapproved
T.O.-13	Lack of torque wrench or adaptor does not allow torquing system in lbs. as called for in note in Fig. 4-31 applying to roll retainers	658-6	2.1.7	038	21-SM0A-2-17-1	APTO 22 VII/77-63-6 submitted.	Approved
T.O.-14	Fig. 3-4d does not agree with Arco's 5-8 and 5-10 of drawing 25-57237, Sheet 2.	658-3	2.3.11	6306	21-SM0A-2-17-1	APTO 22 2-8561-13-102 submitted.	APPROVED
T.O.-15	T.O. doesn't show ramps installed on 11-111 interstage.	658-3	2.3.11	6306	21-SM0A-2-17-1	APTO 22 2-8561-13-103 submitted.	APPROVED
T.O.-16	Rear fitting part number is omitted from item 27 of Fig. 3-10.	658-3	2.3.11	6306	21-SM0A-2-17-1	APTO 22 2-8561-13-104 submitted.	APPROVED
T.O.-17	Application of 145-5-62 to bolts is called out incorrectly.	658-3	2.3.11	6306	21-SM0A-2-17-1	APTO 22 2-8561-13-105 submitted.	APPROVED

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Deficiency Report No.	Abstract of Deficiency	Test No.	T.R. No.	Fig. A Reference	T.O. Reference	Recommendation / Status	Resulting Action
T.O.-18	P/N's are incorrect on items 1, 11, 12, and 14 on Fig. 3-2e.	658-3	2.3.11	636	ZI-S-90A-2-17-1	AFTO 22 2-8504-13-177 submitted	APPROVED
T.O.-19	Item 6 of Fig. 3-21 shows incorrect P/R.	658-3	2.3.11	636	ZI-S-90A-2-17-1	AFTO 22 2-8504-13-176 submitted	APPROVED
T.O.-20	T.O. ZI-S-90A-2-22 is inadequate for performing hazardous current checks	658-6	2.1.7		ZI-S-90A-2-22	Further evaluation will be made. Still under investigation.	
T.O.-21	T.O. should provide procedure for R/V Separation Switch electrical test.	625-5	2.3.31	6167	114-RV11-24	AVCO Technical Publications Investigating. Incorporated in TOCX A	Approved
T.O.-22	T.O. should provide procedure for R/V Separation Switch assembly.	625-5	2.3.31	6167	114-RV11-24	AVCO Technical Publications Investigating. Incorporated in TOCX A	Approved
T.O.-23	T.O. should be revised re. R/V Separation Component mechanical lanyard adjustment.	625-5	2.3.31	6166	114-RV11-24	AVCO Technical Publications Investigating. Incorporated in TOCX A	Approved
T.O.-24	Mounting Bolts and spacers for Autocollimator were not available when required.	658-8	2.1.10	602	36412-3-24-1	AFTO 22 A/V PST-1707 submitted.	Approved
T.O.-25	Procedure for field testing chilled water supply refrigerant.	658-12	2.3.24		ZI-S-90A-2-6	AFTO 22 VII/7E-63-7 has been submitted.	DISAPPROVED
T.O.-26	T.O. ZI-S-90A-2-18-1 has no procedures for leveling and load testing.	658-12	2.3.24		ZI-S-90A-2-18-1	Add procedures for leveling and loading testing procedure given in D-M 11-2. See Wing II T.O. will accomplish. See Para. 3-82 thru 3-82.	Accomplished
T.O.-27	D-1007 calls out a tolerance for leveling support ring and torsion bars but does not specify gradient of increments on precision level.	658-13	2.3.24		ZI-S-90A-2-2	Add note to T.O. procedures stating that each increment on the level represents three minutes.	ACCOMPLISHED
T.O.-28	Lack of established tolerances for leveling airplane prior to unloading. SLM may result in elevation of front end of RT key and extension capability of forward jack struts.	695-1B			ZI-S-90A-2-2	AFTO 22 VII/7E-63-08 submitted.	DISAPPROVED
T.O.-29	Lack of established tolerances for leveling airplane prior to unloading. SLM may result in elevation of front end of RT key and extension capability of forward jack struts.	695-1B			10-1114-9	AFTO 22 VII/7E-63-9 submitted.	APPROVED
T.O.-30	Installation of C711 cable to missile skirt is difficult	021-3	2.3.11		ZI-S-90A-2-17-1	AFTO 22 2-8504-2-17 submitted.	APPROVED
T.O.-31	No work platform to operate RT-AU when tractor is disconnected.	021-1D		4129	ZI-S-90A-2-2	AFTO 22 2-8504-2-3 submitted.	DISAPPROVED
T.O.-32	MCS Guidance Set & Body Section Optical Windows require clean surface to avoid degradation of rail launch air-out. NOT preceding par. 4-9a of T.O. has inadequate procedure on cleaning windows.	0658-4	2.3.9	620	ZI-S-90A-2-17-1	AFTO 22 A/V PST 2 -73 submitted.	APPROVED

* Not reported in Final Ground Test Report - FTR 655, but will be included in subsequent reports.

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Deficiency Report No.	Abstract of Deficiency	Test No	IR No.	Fig. A Reference	T.O. Reference	Recommendation / Status	Resulting Action
T.O.-33	MC3 "No-Go" resulted when platform did not properly erect. Hard, audible contacts with global stops where either ignored or not heard by operators.	658-4	2.3.9	6271	543-2-12-2	AFTO 22 A/W PSTP 2-80 submitted.	DISAPPROVED
T.O.-34	Using MC5 supporting stop the band track during MC5/C711 checkout as a platform, instead of available wooden stands, creates personnel hazard & possible equipment damage.	658-4	2.3.10	6271	Z1-3904-2-17-1	AFTO 22 A/W PSTP 2-81 submitted. Cancelled by PSTP	WAR
T.O.-35	Improper inventory of equipment required for alignment and targeting a mole. often causes extensive time delays.	658-8	2.1.10 2.1.11		Z1-3904-2-1	AFTO 22 A/W PSTP 2-81 submitted. Cancelled by PSTP	WAR
T.O.-36	CAUTION WTS, requiring that C-95 battery power supply be disconnected from C51 GAC coupler within 60 sec. to avoid running down & damaging batteries in C-95, is not necessary as heavy current drain lasts only 2 sec. and is minimal thereafter.	625-8		696	Z1-3904-2-3	Remove CAUTION WTS. AFTO 22 A/W PSTP 107 submitted.	DISAPPROVED
T.O.-37	Incorrect Figure number (3-32) is given against part number 25-3421-3 on Page 5-113 of document.				Z1-3904-4-1	Change Figure to read 3-19. AFTO 22 WII/TF-63-10 submitted.	DISAPPROVED
T.O.-38	Incorrect Figure number (4-35) is given against part number 25-21760-1 on Page 5-97 of document.				Z1-3904-4-1	Change Figure number to read 4-42. AFTO 22 WII/TF-63-11.	DISAPPROVED
T.O.-39	Item 7.0 incorrect T.O. for reference.	625-12			Z1-3904-2-18-1	AFTO 22 WII/TF-63-12 submitted.	APPROVED
T.O.-40	Surface security system fails to reference T.O. for Wires 11-7. Document reference D2-1300-1 incorrect. T.O. for wire 11 Two Monument Targeting and Alignment lacking.	625-12			Z1-3904-2-18-1	AFTO 22 WII/TF-63-13 submitted.	APPROVED
T.O.-41	Incorrect technical order referenced for use.	625-12			Z1-3904-2-18-1	AFTO 22 WII/TF-63-14 submitted.	APPROVED
T.O.-42	Incorrect T.O. referenced for use.	625-12			Z1-3904-2-18-1	AFTO 22 WII/TF-63-15 submitted.	APPROVED
T.O.-43	Incorrect T.O. referenced.	625-12			Z1-3904-2-18-1	AFTO 22 WII/TF-63-16 submitted.	APPROVED
T.O.-44	WTS following step 4-11 of Para. 3-24 (page 3-11b) references incorrect para. (3-55)		2.3.11		Z1-3904-2-17-1	AFTO 22 WII/TF-63-17 submitted.	APPROVED
T.O.-45	Step "a" reference incorrect T.O. (3309-74-12-1)				Z1-3904-2-17-1	AFTO 22 WII/TF-63-18 submitted.	APPROVED
T.O.-46	Transfer of Mol. from SSCM to DP1P or MCB in rainy weather, causes water flow along external stiffeners on SSCM into facility. (WTS cancelled)	622-10	2.1.5	4095	Z1-3904-2-17-1	AFTO 22 WII/TF-63-19 submitted.	DISAPPROVED

* Not reported in Final Ground Test Report - FTH 658, but will be included in subsequent reports.

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Deficiency Report No.	Abstract of Deficiency	Test No.	TR No.	Fig. A Reference	T.O. Reference	Recommendation / Status	Resulting Action
T.O.-47	A special technical is required to prevent damage to the T when seen is translated forward from the DIB or HIB.	621-64		4099	ZI-3400A-2-17-1	AFTO 22 No. 2-8504-9-2-41 submitted.	APPROVED
T.O.-48	Transfer error drift due to temperature changes (Save as T.O.-50. Corrects different section of T.O.)	625-8	2.1.10	631	ZI-3400A-2-1	AFTO 22 No. A/N PSTP 2-115 submitted.	APPROVED
T.O.-49	Failure to bring necessary equipment to target. (Save as T.O.-50. Corrects different section of T.O.)	625-8	2.1.10 2.1.11	4062	3612-24-1-1	AFTO 22 No. A/N PSTP 2-116 submitted.	DISAPPROVED
T.O.-50	Transfer error drift due to temperature changes (Save as T.O.-48. Corrects different section of T.O.)	625-8	2.1.10	631	ZI-3400A-2-1	AFTO 22 No. A/N PSTP 2-121 submitted.	APPROVED
T.O.-51	Lack of procedures for use of LP Start Up unit.	625-8	2.1.11	4491	ZI-3400A-2-1	AFTO 22 No. A/N PSTP 2-125 submitted.	APPROVED
T.O.-52	Retargeting procedures are incorrect.	625-8	2.1.11		ZI-3400A-2-1	AFTO 22 No. A/N PSTP 2-116 submitted.	APPROVED
T.O.-53	Final Five (5) degree rotation during missile indexing is not included in any T.O. for Fig. 11.	625-8	2.1.11	1322.2	ZI-3400A-2-1	AFTO 22 No. A/N PSTP 2-127 submitted.	APPROVED
T.O.-54	Reference of Faulty Mech. Code Entry (Fig. 25-256-6) in Launch Control Panel (25-22-76-18) requires return of panel to depot level for repair and overhaul per T.O.			1243	ZI-3400A-18	AFTO 22 No. 2-8504-12-117 submitted. Sent to COMA for action.	
T.O.-55	Reference to Fig. 5-5 is incorrect as no such figure is listed in subject T.O.				ZI-3400A-2-8	AFTO 22 No. VII/TF 63-20 submitted.	
T.O.-56	Step 3 refers to T.O. 21-3400A-2-9 to disconnect cable from J01 on umbilical retractor. Correct reference should be T.O. 21-3400A-2-24 Fig. 1-2.				ZI-3400A-2-10	AFTO 22 No. VII/TF 63-21 submitted.	
T.O.-57	Use of word "type" is confusing during cable installation, as this word is a repeating term. (Ref. Figure 2-9, lines 2 & 17).	625-12			ZI-3400A-2-11	AFTO 22 VII/TF 63-22 submitted.	
T.O.-58	Step 4, Par. 4-17, removes only one support plate when removing specified bolts. Both plates are critical to allow use of ballistic actuator harness for actuator removal.	625-12			ZI-3400A-2-11	AFTO 22 VII/TF 63-23 submitted.	
T.O.-59	No ladder called out in Ref. Fig. Ladder needed for operation of air conditioning unit on B.T.	Wing III 770-1B			ZI-3400A-2-2	AFTO 22 VII/TF 63-24 submitted.	
T.O.-60	SC12 Battery installation instructions are out of sequence.	Wing III 770-4	2.3.9	6209	ZI-3400A-2-17-1	AFTO 22 A/N PSTP 3-5 submitted.	
T.O.-61	Five indexing instructions removed from T.O. are required to accomplish test. Not available in any other T.O.	625-6	2.1.10 2.1.11	137.2	ZI-3400A-2-1	AFTO 22 A/N PSTP 2-130 submitted.	

ISSUE DATE: TECHNICAL GROUP DEFICIENCY STATUS REPORT

Deficiency Report No.	Abstract of Deficiency	Test No.	Fig. A Reference	T.O. Reference	Recommendation / Status	Resulting Action
T.O.-62	Passing of object between collimator GAC collimator window interrupts beam & will cause "Emergency Alert" condition.	625-9	3.1.4	21-SP04-2-1	AF70 22 2-8504-51-2-129 submitted.	
T.O.-63	Present procedure does not provide for installation of flamehold tape on KCU unballied cables.	-12		21-SP04-2-18-1	AF70 22 2-8504-52-(126) submitted.	
T.O.-64	Par. 4-21, item 19 of T.O. does not indicate that accomplishment is only possible at operational hazard but not at VITE.	Wing III 770-1B	2.3.1	21-SP04-CL-2-2-6	AF70 22 2-8504-51-3-9 submitted.	
T.O.-65	T.O. lacks instructions in Par. 4-18, step 4 to provide power to BMC from ACU causing failure to provide electrical power to operator. BMC is damaged, and possible damage to ACU as all decks are closed off.	Wing III 770-1B	2.3.1	21-SP04-2-2	AF70 22 2-8504-51-3-10 submitted.	
T.O.-66	Fig. 2-8, Step 7 of T.O. fails to indicate correct action if holdstalling mode continues lowering after release of "10-73" button.		4066	21-SP04-2-2	AF70 22 2-8504-52-(132) submitted.	
T.O.-67	The technical order is inconsistent with configuration. It calls for Gross Temperature indication. It calls for Gross Temperature indication. It calls for Gross Temperature indication.	625-4		21-SP04-2-17-1	AF70 22 A/W PSTE 2-94 submitted.	
T.O.-68	Paras. 2-36 & 2-37 direct the removal of the shorting cap from 4P3 underneath the MCS. This is only applicable to the KALIP M-3.	625-4		5A1-2-32-2	AF70 22 A/W PSTE 2-95 submitted.	
T.O.-69	Step 2, Page 10 of checklist is unnecessary.	625-7		21-SP04-CL-2-16-1	AF70 22 394MS-63-239 submitted.	Approved
T.O.-70	Add to para. 2-41, step 4 "Subfunction selector to verify CDS" and "Code Selector to Fire position" for clarity.	625-7		21-SP04-2-16	AF70 22 394MS-63-240 submitted.	Disapproved
T.O.-71	Check of WAT-10 board of Para. 2-3 of T.O. 5A1-2-32-2 and Para. 4-3 of T.O. 21-SP04-2-17-1 to take required precautions against toxic coating of WIS equipment, may cause severe aim flash and/or sickness.	Wing III 770-4	2.3.9	21-SP04-2-17-1 5A1-2-32-2	AF70 22 A/W PSTE 3-15 submitted.	
T.O.-72	All retainers are stamped with torquing values, but this is ulitment dropped from T.O. Confirmation exists as a result.	625-6		21-SP04-2-2	Add note to estimate, not measure torque values. AF70 22 WII/IT-63-25 submitted.	
T.O.-73	Electrical checks & about valve installation for KCU not contained in T.O.	625-6			Procedure should be included in T.O. for 3-0 valve problems.	121
T.O.-74	Figure 4-24 does not include cable J425A. This cable is applicable. Integrated Checkout book-up of the KCU-22 MCS.	625-4		21-SP04-2-17-1	AF70 22 A/W PSTE 2-95 submitted.	
T.O.-75	Theodolite stand adjustment rods are not used from time of adjustment until removal of stand. Interfere with movement of operator.	625-8		21-SP04-2-17-1	AF70 22 WII 17-63-75 submitted.	
T.O.-76	Steps 9 & 12 of checklist are reversed. Will result in completion error.	625-8		21-SP04-CL-2-1-2	AF70 22 A/W PSTE 2-102 submitted.	
T.O.-77	Detail task assignment unnecessary at this level - will increase targeting time.	625-9		21-SP04-CL-2-1-1	AF70 22 A/W PSTE 2-104 submitted.	

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DEFICIENCY STATUS REPORT

Deficiency Report No.	Abstract of Deficiency	Test No	T.R. No.	Fig. A Reference	I.O. Reference	Recommendation / Status	Resulting Action
3-1	Air Force technicians did not wear safety equipment in cutting metal strapping	021-5	2.1.1 2.3.31			Safety training required. Advise EPTC Safety	Accomplished
3-2	Compressed air for removing dust. Safety equipment should be worn	021-5	2.1.1			Safety training required. Advise EPTC Safety	Accomplished
3-3	During checkout of R/V Assy., R/V test set was rolled over energized power cable	021-5	2.1.1 2.3.31			Safety training required. Advise EPTC Safety	Accomplished
3-4	Air Force technician failed to employ safety procedure in using Toluene	021-5	2.1.1 2.3.31			Safety training required. Advise EPTC Safety	Accomplished
3-5	Grounding connection was disconnected from R/V during application of heat shield tape	021-5	2.1.1 2.3.31			T.O. procedure should be followed.	TAR
3-6	Hot concrete walk to S/A device test chamber in rainy weather is hazard to personnel carrying equipment	021-5	2.3.11		ZI-S9004-2-17-1	Non-slip type surface should be provided on concrete walk.	Letter to EPTC Safety
3-7	Protrusions on DP18 #2 steps is hazardous.	021-3	2.3.11		ZI-S9004-2-17-1	Paint protrusion yellow. Write letter to EPTC Safety.	Accomplished
3-8	Ordinance pre-charging of LC5 - 1st stage - leads to hazardous operation	021-3	2.3.11	6313	ZI-S9004-2-17-1	Change Recommendation letter #2 submitted to RCD (EPTC) - Norton AFB, 19 June '63 during sig 1	
3-9	No work platforms for performing work on a Missile in an RCB.	021-6		9178	ZI-S9004-2-17-1	Perform operation in an RCB in TDR-100001 C-12.	TAR
3-10	Hazard exists while setting R/V to RCD due to height restriction of the work cage.	021-6	2.1.9	4943	3544-2-31-1	Engineering to evaluate work cage for restriction for sig 1 and follow on steps. TDR-100001 C-12, 7-2-63 submitted for revision and review.	
3-11	No work platform is provided for the RVC air conditioning unit. Technicians stand on a narrow rail.	021-10			ZI-S9004-2-2	Add caution note to T.O. to use a ladder for access to the A.C.U. control panel. APTO 22 5711-17-63 submitted.	Disputed APTO
3-12	Cables of test set A/T 257-1 are too short. It is hazardous to perform check while holding the cables.	625-9		3007		Lengthen test cables by 6 feet. Design engineering notified.	
3-13	Control of portable pump from bottom of silo results in occasional mild electrical shocks.	625-12				Pump should be operated from LFR. Further investigation in process.	
3-14	Lunch tube access door which is a hazard to personnel working near the access door.	625-6				Operationally, problem reduced by light traffic in area. For VAPB, better padding should be added.	
3-15	Theodolite stand adjustment rods are not used from time of adjustment until removal of stand. Interferes with movement of operator.	625-8			ZI-S9004-2-17-1	APTO 22 5711-17-63 submitted.	